Volume 73 No 4
April 2005

Amateur Radio

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The magazine for
AUSTRALIAN radio amateurs

A new generation gets the bug!

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Brian Clarke VK2GCE

A pi-coupler for the compact 160 m vertical (and HF antennas)
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More information on the VK5BR_X3 antenna
Lloyd Butler VK5BR

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GENERAL

TECHNICAL

COLUMNS

Our Cover this month

Karsten Thole VK5ZKT in his shack. Karsten is one of a younger group of amateurs who got the bug early, listened to CB, Short Wave broadcasting and amateurs. First licenced as VK5HKT he continued his studies at TAFE to get a Certificate III of Electronic Engineering (RF Communications) which provided him with further employment oportunities and also exemption from the full call theory section of the Amateur licensing requirements. People like Karsten need all the encouragement we can give them both before they get their licences and once they get on the air. Now read his article on page 27.

Contributions to Amateur Radio
Amateur Radio is a forum for WIA members' amateur radio experiments, experiences opinions and news. Manuscripts with drawings and or photos are always welcome and will be considered for publication. Articles on disc or email are especially welcome. The WIA cannot be responsible for loss or damage to any material. A pamphlet, How to write for Amateur Radio is available from the National Office on receipt of a stamped self-addressed envelope.

Back Issues
Back issues are available directly from the WIA National Office (until stocks are exhausted), at $4.00 each (including postage within Australia) to members.

Photostat copies
When back issues are no longer available, photocopies of articles are available to members at $2.50 each (plus an additional $2 for each additional issue in which the article appears).

Disclaimer
The opinions expressed in this publication do not necessarily reflect the official view of the WIA and the WIA cannot be held responsible for incorrect information published.

Amateur Radio Service

A radiocommunication service for the purpose of self-training, intercommunication and technical investigation carried out by amateurs; that is, by duly authorised persons interested in radio technique solely with a personal aim and without pecuniary interest.

Wireless Institute of Australia

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Founded 1910

Representing
The Australian Amateur Radio Service

Member of the
International Amateur Radio Union

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Editorial comment

Colwyn Low VK5UE

The changing voice of radio etiquette

Hi members and readers,

We all have an interest in amateur radio and we should all work hard to present the best image possible of our great hobby.

We need to remember always that everything we say on air is said on an open frequency and anyone can listen. Every now and then someone does something which annoys us and we feel we have to let our friends know about it. However doing this on air creates a very bad impression of what amateurs are. In my experience "having a go" at someone without first checking the facts is not very helpful. It is much better to have a chat about the matter and then make a decision about whether you can each have an opinion. The world will not end if a counter view is held.

Some times someone else needs to act as arbitrator when things could get out of hand. We really need to read the Amateur Code in the ARRL Handbook and use that as a guide to how we treat our hobby, our fellow amateurs and ourselves. One area where we will have to think carefully, is how we treat our fellow amateurs when the Foundation licence brings a completely different group of people to join our ranks on the air. We will need to remember they need guidance and assistance to be shown what "in depth" amateur radio is and maybe corrected in how they are using their equipment and the RF spectrum. We also need to remember times have changed eg ICW is not the only mode we can use these days.

I had a good amateur month in March. Got most of the gear working and went out in the field with my VHF transceivers and the "cheap portable generator" worked flawlessly. As did VK5AIM's. I also noted that Summerland ARC used at least one of these and they were equally impressed. I have still to perfect sleeping arrangements in the Beetle. Without the backs for the back seat and the passenger seat there is plenty of room down the passenger side, you just have to get it padded where your hip bone is !!!!

I am publishing two letters this month, one from Col Harvey VK1AU trying to trace all amateurs who were killed in WWII, as he feels our present information is still inaccurate. The second a request for AR to publish a directory once or twice a year of suppliers of components. Gone are the days when components and kits were a major proportion of the stock in the local DS store. I wonder if someone in each major centre would be willing to collect the local information and send it to me. Better still would someone coordinate the information and present me with a final collation.

Enough for now. Have a great activity month in April, work the Harry Angel Sprint and otherwise enjoy your hobby.

73 Colwyn VK5UE

Wireless Institute of Australia

2005 Annual General Meeting

7 May 2005

Michael Owen VK3KI

Assessment of competency in amateur radio

In the December 2004 issue of "Amateur Radio", under the heading "A better qualification system" I wrote about the possibility of replacing the present system of Group Leaders, Invigilators and Examiners with a system of accredited assessors.

I pointed out that a competency-based training approach has been adopted in Australia, and is the basis of the nationally recognised qualifications based on the Australian Qualifications Framework. I said that we were considering a system whereby WIA assessors are formally trained by a Registered Training Organisation (RTO), and accredited and registered by the WIA.

An audit procedure would be established and all assessors would be subject to audit. Assessor registration would last for a period of three years, after or during which time the assessor would be reviewed and where appropriate re-registered by the WIA.

I thought it important that the adoption of such a system would mean that the candidate could learn immediately whether he/she is competent or is not yet competent, and importantly, that the assessor would be able to explain the decision and be able to tell the candidate what he/she needs to do to become competent.

I asked for your opinion. At that time I had only raised the idea with one group.

Since then I have met with a number of clubs, including a group of representatives of clubs in Adelaide, and clubs as far away from Melbourne as Alice Springs and Darwin.

At each meeting I have raised the issue of accreditation, very much in the context of the fact that it would involve in time at least a full weekend to qualify.

I certainly do now have a very clear view of the opinion of many people, particularly of those from the clubs involved in the present WIA Examination System.

There is a general view that the present system can be very negative. It can be far too long before the candidates know whether they have qualified. And even then, no real guidance as to the areas where more work is needed is necessarily readily available. Most involved in the present system feel that immediate and constructive guidance designed to encourage achievement of the required standard would be highly desirable, particularly when the objective of all of us must be to encourage more people to become amateurs.

In short, everyone I have spoken to involved in the current system believes that what we have at present can be substantially improved. And everyone is prepared to give the full weekend necessary to achieve accreditation.

I have been really encouraged by that response.

It also makes me confident about the successful introduction of the Foundation Licence, with practical assessment a requirement of qualification.

So, what is the next step?

The WIA, in one sense, faces a dilemma. As we know from the ACA's "Outcomes of the Review of Amateur Service Regulation", May 2004, the ACA has decided to proceed with the outsourcing of certain functions, including the management of examinations, which is currently delegated to the WIA. These functions can be expected to be subject to competitive tender.

So, without giving too much away, the WIA, with the network of clubs being one of its strengths in providing examination facilities across the country, could rely on the proposed accreditation of assessors as part of its tender.

On the other hand, there is no certainty as to when the new Foundation Licence will come into force, and the WIA's specialist group is still developing the syllabi for all three levels of licence, but perhaps around May or June may be realistic.

I certainly know that there are many clubs and individuals in the clubs anxious to move ahead with encouraging potential Foundation Licensees to qualify.

It would hardly be right for the WIA to place any impediment in the path of those wishing to move ahead. And doing nothing to preserve some sort of perceived advantage over any potential but presently unidentified competitor hardly seems the way that the WIA should behave. After all, the WIA exists to protect and promote amateur radio.

But how will the Foundation Licence candidates be assessed? I don't think we can keep the means by which we propose to make the whole amateur qualification system more attractive secret.

But what if we all take the time and spend the money, and then the ACA says, no, it wants some sort of different system?

That is the risk that we are prepared to run. Simply because we believe that the Authority must have proper regard to the WIA's non-commercial duty to amateurs and to amateur radio.

The WIA is prepared to work on the basis that the ACA will accept the WIA's proposal for accredited assessors, and to move ahead with establishing the means of accreditation.

As I said in the December article, assessor accreditation is achieved through a Registered Training Organisation, an RTO. The WIA plans to offer to clubs the opportunity for at least one and perhaps two of their members currently involved in the examination system to become accredited at courses conducted by an RTO, probably in Brisbane, Sydney, Melbourne and Adelaide.

This will involve the cost of travel and accommodation for those not living close to those cities.

Currently, we are exploring how this can all be achieved. We would hope that the clubs will be able to provide some funding, perhaps with some contributing more than others. Perhaps the WIA itself can make some contribution. It certainly will meet the costs associated with providing the course.

We know, only too well, how far from those four cities many clubs, that are an essential part of the WIA Examination System are.

I hope that we shall be able to announce dates and venues soon, with plenty of notice for those we hope will attend.

But do understand that the WIA will do all it can to facilitate the early and successful introduction of the Foundation Licence.

ar

WIA news

President visits Alice Springs and Darwin radio clubs

WIA President, Michael Owen, VK3KI, visited the Alice Springs Amateur Radio Club on 4 March, joining a group for a most interesting and useful dinner discussion.

The following Monday evening saw Michael talking to about 25 members of the Darwin Amateur Radio Club at their rooms in Fanny Bay.

At both meetings Michael spoke about the development of the WIA, and the progress with the changes to the structure of amateur licensing, particularly the Foundation Licence, and the need for clubs to be ready to promote that licence.

At both meetings discussion included the WIA proposal for the accreditation of assessors, particularly the distance of both clubs from the centres where courses could be conducted.

Australia proposes table allocation to amateur at 135.7-137.8 kHz

Item 1.15 of the agenda for the next ITU World Radiocommunication Conference in 2007 ("WRC-07") is "to consider a secondary allocation to the amateur service in the frequency band 135.7-137.8 kHz".

Currently the only proposal to satisfy agenda item 1.15 is the entry of a footnote. At the recent Asia-Pacific Telecommunity Conference Preparatory Group for WRC-2007 held in Bangkok, Thailand, between 28 February and 3 March 2005 Australia proposed as a second method of satisfying the agenda item, an allocation to the Table, rather than a footnote.

That proposal received support, and now Australia will move to forward the position it suggests to the relevant ITU Study Groups Working Party. The Australian paper is available on the WIA web site.

IARU Region 3 participates in APT Conference

IARU Region 3 was represented at the Asia-Pacific Telecommunity Conference Preparatory Group for WRC-2007 held in Bangkok, Thailand, between 28 February and 3 March 2005 by Region 3 Chairman, YS Park, HL1IFM and David Wardlaw, VK3ADW.

The meeting was attended by 25 Member administrations with 161 delegates and 29 Affiliate members with 61 observers and 8 international organizations with 27 observers.

IARU Region 3 submitted a paper "The Better Utilization of the Amateur Radio Service as a Resource for Disaster Communications". The paper draws attention to the role of amateurs in the recent Tsunami disaster and also to the changes made to the international regulation governing the amateur service at the last ITU WRC. These changes enhance the opportunity to use the amateur service in such situations. The paper stresses the need for national regulations not to inhibit preparation for and participation in disaster support. A copy of the paper may be found on the WIA web site.

WIA Director in follow-up interview on Melbourne radio

WIA Director Robert Broomhead was a guest on Monday 14 March on Melbourne's 3WBC FM weekly Tech Talk Radio program. This was a follow up to an original interview that took place on 24th January.

Work starts on 2006 Callbook

The call book production team needs your help. They ask all contributors who supply non call sign information to look at any amendments that may be required to information published in the 2005 issue.

Any corrections to the actual call sign information should be submitted to the ACA before June 30, 2005.

The team would be happy to receive high quality photographs that may be suitable for the front cover.

Please email information to callbook@wia.org.au or post to Callbook, PO Box 2175, Caulfield Junction, Victoria 3161.

Melbourne's EMDRC White Elephant Sale

Melbourne's Eastern & Mountains District Radio Club (EMDRC) White Elephant Sale was held on Sunday, March 6. The White Elephant Sale (or WES) is one of VK3's biggest hamfests, with this year's event being no exception seeing amateurs travelling from all over Victoria to be part of this special day.

The national WIA was once again in attendance with its new corporate stand proudly showing its range of updated promotional material and new WIA merchandise.

This is the second appearance for the new WIA stand, the first appearance being at last month's Wyong Field Day. Vice President Ewan McLeod along with Director Rob Broomhead were in attendance and were ably assisted by Emma Trebilco from the WIA office.

"WIA membership was being promoted and we had such an encouraging response with no fewer than ten people joining the WIA as first time members and countless others who took the opportunity to renew their existing membership. It was a great day and a fantastic opportunity for Ewan, Emma and me to meet and have a chat with our local troops. We have really appreciated the overwhelming support and many kind words of encouragement for the work being done" Robert said.

Australian optical communications record broken in Tasmania

Mike, VK7MJ on Mt Wellington and Chris Long on South Barrow have set a new Australian record for full duplex optical communication over a path of 167.7km using voice.

The contact occurred between 1100 and 1200 UTC on Saturday, February 19, 2005. Two way full duplex voice communication was established at 475 TERAHERTZ (that's right - visible light), over a distance of 167.7km between stations on the summits of Mount Wellington near Hobart and South Barrow, near Launceston Tasmania.

The Worlds First IRLP Contest

The Bass IRLP Group located in Melbourne HYPERLINK in conjunction with the Chesapeake AR Club in the USA HYPERLINK has organised the world's first IRLP Contest.

The contest commenced on March 18, 2005 and runs through until the April 17, 2005. The prize for this contest is a very nice trophy, donated by Marine Computer Technology, Queensland. The competition, whilst titled the "1st Annual Aussie-American International IRLP Contest" is open to any amateur in any country, so long as an IRLP node can be accessed to participate.

ar

Yet another RF bridge

Dale Hughes VK2DSH

There have been many designs for radio frequency impedance bridges published, and each design offers various features and frequency coverage. Some designs have the ability to measure resistance and reactance, while others measure only resistance. For antenna measurements the main requirement is the ability to measure resistance as some indication of reactance can be gained by varying the frequency and observing if the frequency is above or below resonance. If there is the need to measure the input impedance of amplifiers or other types of networks, the ability to measure reactance and resistance is useful.

Bridges designed for frequencies above a few Megahertz can have problems with stray capacitance and inductance. These effects have the potential to increase measurement uncertainty if care is not taken in the construction and use of the instrument. For transformer coupled bridges, reference (1) gives a comprehensive analysis of the sources of measurement uncertainty and how they can be minimised. The main factors are the use of a well balanced coupling transformer and the addition of a small inductor in the $Z_{unknown}$ side of the bridge to compensate for stray inductance in the reference side of the bridge. This design uses those techniques.

My need was for a bridge that was useable over the range of 3 to 40 MHz and which used either an internal noise source, or an external source of bridge excitation. This design allows a receiver or an in-built RF voltmeter to be used as a null detector. The user can configure the bridge according to his or her need by using a short coaxial cable. This unit was built to measure resistances over the range of 10 to 200 Ω in parallel with capacitance between ± 200 pF. The more familiar series impedance can be calculated and expressed in the form of:-

$$Z = R \pm jX$$

where $j = \sqrt{-1}$

by using equations given later. I have found the instrument useful for measuring the input impedance of amplifiers and mixers when developing receivers and transmitters; it is also useful for measuring the impedance of antennae so that they can be tuned to a given frequency.

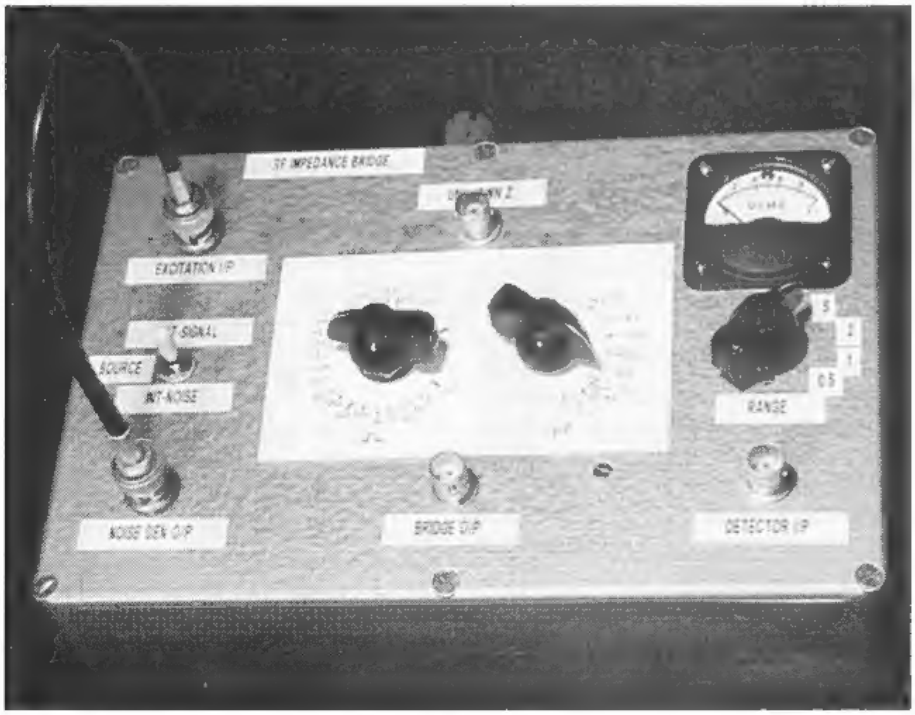

Figure 1: The RF impedance bridge configured to use the internal noise generator for bridge excitation.

Circuit description

The complete unit is made up of three sub-sections:

1. The bridge is variation of the well known Wheatstone bridge, in a configuration known as a 'hybrid coil' or 'transformer-ratio-arm' bridge. Transformer, T1, splits the excitation signal into two parts. One part feeds the unknown impedance that is connected to X3 ($Z_{unknown}$), the other part of the excitation signal feeds the reference resistor and capacitor (R1 & C1) which are adjusted to match the impedance connected to the X3. When the impedances on both sides of the secondary of T1 are equal, the signal at X2 falls to a very small value and the detecting device indicates a null condition. Connector X3 has a 200 pF capacitor in parallel, so the bridge will balance when variable capacitor on the reference side is also set to 200 pF ± $X_{unknown}$. If the unknown impedance has a reactive component, capacitance can be added or subtracted from the reference side to balance the bridge. If the unknown impedance is capacitive, the variable capacitance is increased until a null is detected. If the unknown impedance is inductive, the variable capacitance is decreased until a null is detected. Thus inductance can be measured by converting the decrease in capacitance ('negative capacitance') to an equivalent inductive reactive. Inductor L1 is used to compensate for stray inductance on the reference side of the bridge and it is critical in reducing measurement uncertainty at higher frequencies. How to adjust L1 is covered in a later section.
2. A source of excitation is provided by a wide band noise generator. A Zener diode is used as the

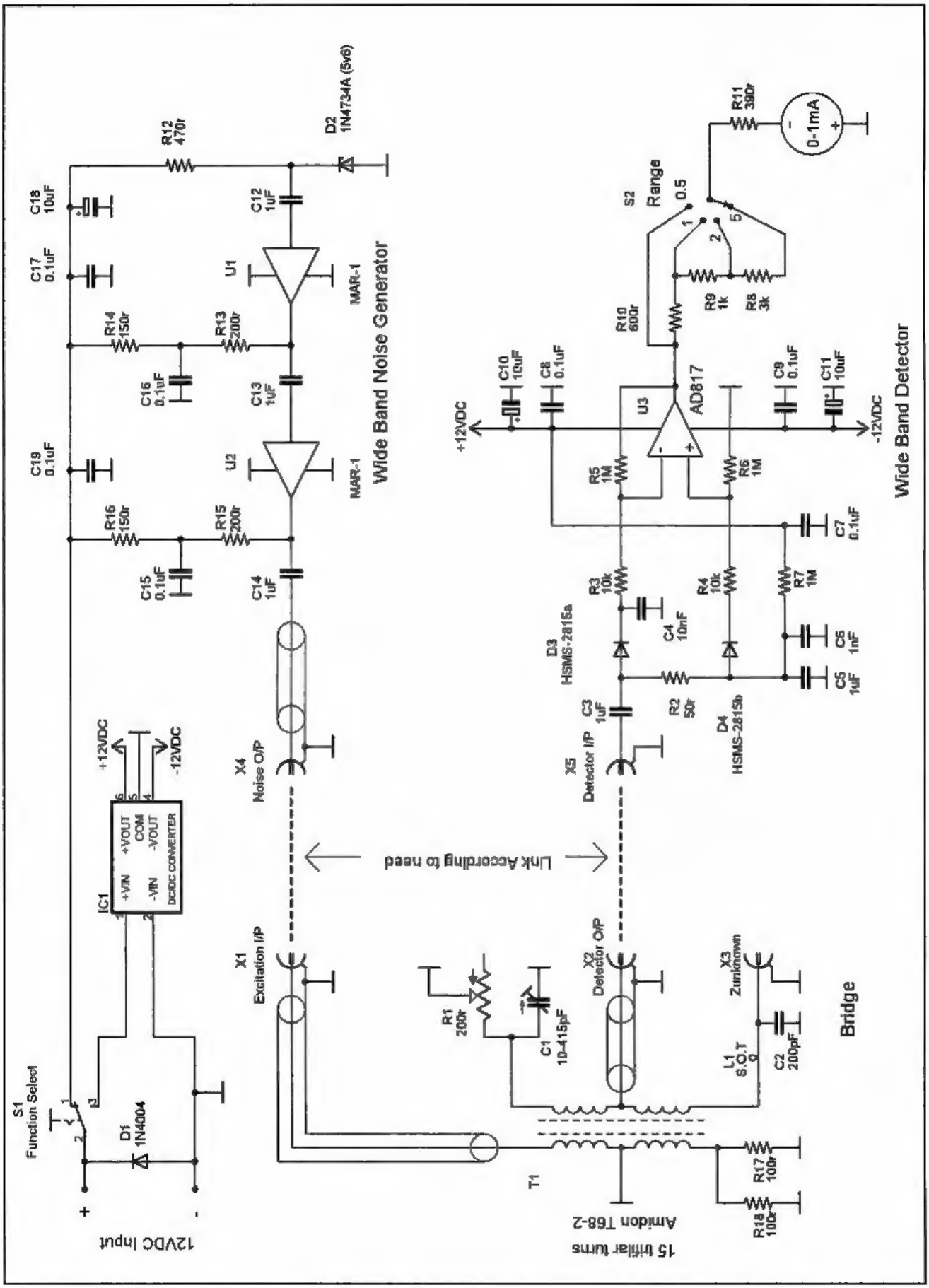

Figure 2: Schematic diagram of the radio frequency impedance bridge.

noise source and the noise signal is amplified by a pair of MAR-1 amplifiers. The two amplifiers have a combined gain of approximately 36 db and the noise output is more than adequate for the task. Other types of amplifiers could be used if they are more readily available. The noise source supplies bridge excitation when it is used in the 'noise bridge' mode. In this case the detector needs to be a receiver or other frequency selective device. (Note: the noise generator output extends to approximately1 GHz and can be used as a signal source for testing VHF and UHF receivers.)

3. A sensitive null indicator is provided by diodes D3 and D4. Their output is amplified by U3 and the detected voltage is used to drive a meter through a range switch. The detector circuit is useful when the bridge is excited by a signal generator or other source of sine wave excitation. The detector circuit is very sensitive as the diodes are forward biased; thus, only a few tens of millivolts are needed to excite the bridge. Two diodes are used in a differential mode so that temperature drift is cancelled out, giving a very stable output.

Note: No usable null can be detected if the in-built noise source is used to excite the bridge when the diode detector is used. This is because the bridge will only balance at one frequency for any given impedance and a wide band noise source contains many frequencies instead of just one. This same problem can occur if an external source of excitation is used and it does not have a high degree of spectral purity. Measurement problems will occur if the sine wave excitation is distorted, thus containing harmonics that will not balance out.

Construction

My unit is built into a die-cast box. Most of the circuitry is assembled on the underside of the box lid, with all connections made as direct as possible. The noise generator is mounted on the inside base of the box and is connected by a short length of RG-174 coaxial cable to the front panel connector. None of the components is especially critical; although the reference potentiometer must be a carbon composition type, the wire wound type have too much self-inductance to be useful.

Conversion between series and parallel components

The usefulness of this bridge is enhanced if the user has knowledge of how to convert between equivalent series and parallel circuits. At any given frequency, a parallel combination of resistance and reactance can be converted to an exactly equivalent series combination (see Figure 3).

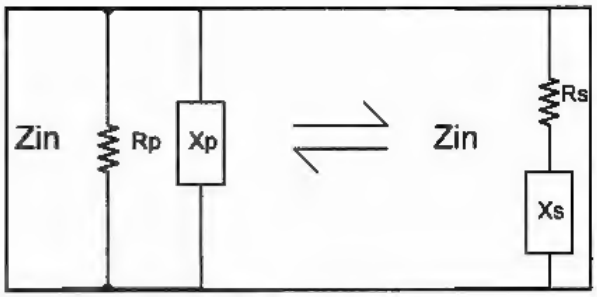

Figure 3: Parallel and series circuits.

The following equations link the two circuits:

$$R_P = \frac{R_S^2 + X_S^2}{R_S}$$

$$X_P = \frac{R_S^2 + X_S^2}{X_S}$$

$$R_S = \frac{R_P X_P^2}{R_P^2 + X_P^2}$$

$$X_S = \frac{R_P^2 X_P}{R_P^2 + X_P^2}$$

Where X is reactance given by:

for inductors: $X = 2\pi f L$

for capacitors: $X = \frac{1}{2\pi f C}$

An example of using these equations is given in the section that covers the calibration of the instrument.

Bridge calibration

The first step is to adjust L1, which compensates for stray inductance on the reference side of the bridge. In my bridge, L1 was a short length of wire approximately 2 cm long soldered between the $Z_{unknown}$ connector and transformer T1. The position of the connection to T1 on L1 is adjusted so that the inductance on both sides of the bridge is the same (see Figure 4).

The procedure is as follows: Connect a low inductance 50Ω resistor to X3 ($Z_{unknown}$) and balance the bridge at the lowest possible frequency. Record the setting of the reference resistor and capacitor. Repeat the process at the highest possible frequency while adjusting the tap position on L1. Note the resistance and capacitance values required to balance the bridge and a point will be reached when the resistance and capacitance required to balance the bridge at the highest frequency are the same as those required at the lowest frequency. This is the correct value for L1. The excess wire on L1 can be removed if desired.

Following the adjustment of L1, the bridge is easily calibrated using a digital ohmmeter, a few precision capacitors and a number of inductors. The resistance control is calibrated by disconnecting the null detector and connecting the digital ohmmeter to X3. The measured resistance, over its range, can be marked on the scale. A 10 Ω increment is sufficiently accurate.

Capacitance can be calibrated by using various precision capacitors in parallel with a resistor of known value. I used a 100 Ω resistor in parallel with capacitors in the range of 20 pF to 200 pF. The capacitors were silver mica types with a tolerance of ± 2 %. Connect each capacitor in turn, balance the bridge and

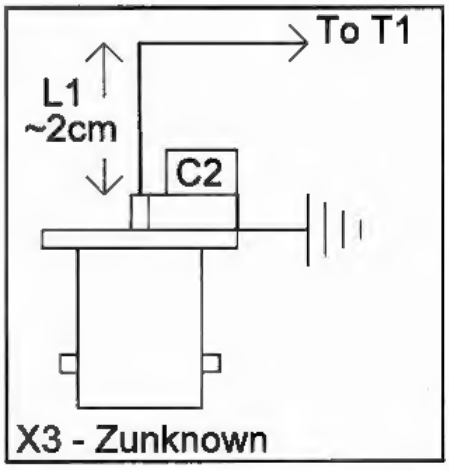

Figure 4: Location and approximate size of compensating inductor, L1.

mark the capacitance on the scale. Use the shortest possible leads on the resistor and capacitor so that stray inductance and capacitance is minimised.

Calibration of 'negative capacitance', or inductance, requires a bit more work.

Table 1 shows a suitable range of inductance and equivalent negative capacitance. Connect the given resistor (R_s) in series with the given inductor (L_s) and connect the series pair to X3. Set the signal generator to the required frequency and balance the bridge. When a null is detected the position of the dial pointer can be marked on the front panel of the bridge. The same can be achieved by using a receiver tuned to the given frequency and using the noise generator for bridge excitation.

Table 1: Sample calibration points for 'negative' capacitance.

R_s(Ω)	L_s(μH)	f-MHz	R_p(Ω)	C_p(pF)
68	1	4.0	77	-190
68	1	7.0	96	-152
27	0.22	28.0	82	-99
68	0.22	7.0	89	-46

The inductors I used were from FARNELL. The 0.22 μH was catalogue number 108-617 and the 1 μH was catalogue number 608-440. The self-resonant frequency of both inductors was well above the frequencies used to calibrate the bridge. Note that the tolerance of the inductors was ± 10 %, so the calibration uncertainty of the negative capacitance is higher than the positive capacitance.

Other combinations of inductors and resistors can be used to calibrate added points if required. For example, if a point at -120 pF is required and you have a signal generator that outputs a frequency of 20 MHz, select a value for the parallel resistor as, say, 100 Ω. The following calculation is then performed to calculate the required inductor:

This means that a series combination of 30.5 Ω and 0.37 μH will be measured as a parallel combination of 100Ω and -120 pF. Thus, the 'negative' capacitance values can be calibrated by selecting a range of convenient inductors and resistors and selecting a suitable measurement frequency. This method is iterative; so many calculations may be involved before obtaining convenient values of inductance and resistance. A spreadsheet or programmable calculator is useful to reduce the effort involved in the calculations.

$$C_p = -120\ pF$$

$$R_p = 100\ \Omega$$

$$Xp = \frac{1}{2\pi \times 20 \times 10^6 \times 120 \times 10^{-12}} = 66.315\ \Omega$$

$$Xs = \frac{100^2 \times 66.315}{100^2 + 66.315^2} = 46.06\ \Omega$$

$$\& \quad R_s = \frac{100 \times 66.315^2}{100^2 + 66.315^2} = 30.5\ \Omega$$

$$\therefore Ls = \frac{46.06}{2\pi \times 20 \times 10^6} = 0.37\ \mu H$$

The main difficulty with this approach is how well the value of the inductor is known and this will affect the calibration uncertainty. However it is likely that the end result is accurate enough for most amateur use.

Measurement uncertainty

To assess the measurement uncertainty of the completed bridge, a set of measurements was made using a high quality 50 Ω dummy load as the unknown impedance. The bridge was excited using its internal noise source and a receiver was used as the null detector. Eleven measurements were made of the 50 Ω load at six different frequencies (3.5 MHz, 7.0 MHz, 14.0 MHz, 21.0 MHz, 28.0 MHz & 38.0 MHz). The resistance of the reference potentiometer was measured with a digital ohmmeter and the capacitance was read from the scale after the bridge had been balanced. A mean value and standard deviation were calculated from each set of eleven resistance measurements (See Figure 5).

For each of the measurements the measured capacity was, approximately, Zero. This value is limited by the ability to read the capacitance scale. The results indicate that the measurement uncertainty (for resistance) is generally less than ± 5 % over the range of 3.5 MHz to 38 MHz. The error bars indicate a 95% confidence interval, that is, there is 95% chance that any individual measurement will be within the given uncertainty limits. Overall, the limiting factor is how well the values can be read from the instrument scales, although using a digital ohmmeter helps considerably in establishing the true resistance value. Refer to the previous

comments regarding issues of spectral purity of the excitation frequency, as this will also affect measurement uncertainty.

Conclusion

An admittance bridge that is useful for measuring the resistive and reactive component of antennae and circuit networks has been presented. With care, accurate measurements of resistance, capacitance and (to a lesser extent) inductance are possible between 3 and 40 MHz. The main limitation is how accurately the indicator dials can be calibrated and read.

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[1] 'RX noise bridge improvements', Robert A. Hubbs, W6BXI and A. Frank Doting, W6NKU. Ham radio magazine, February 1977.

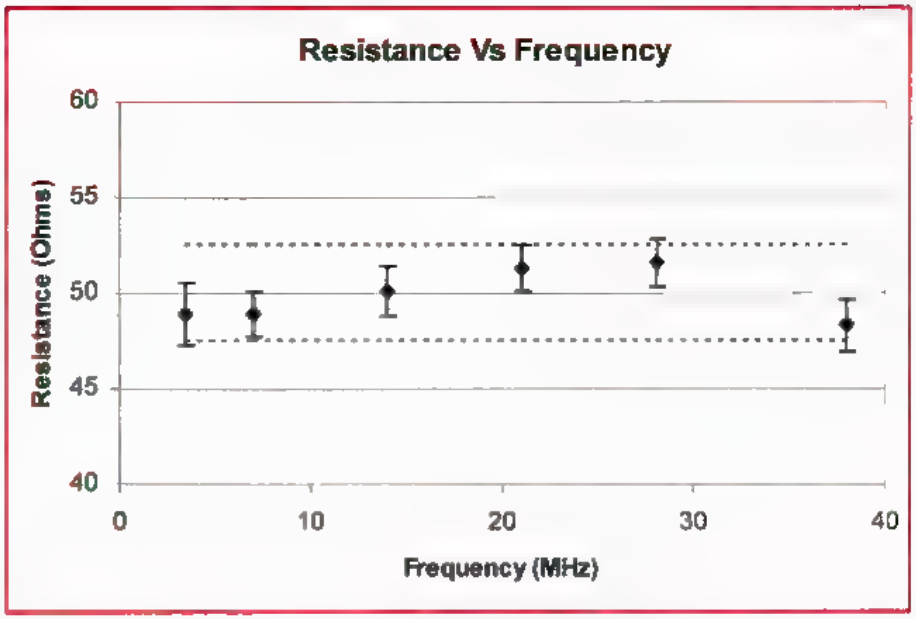

Figure 5: Uncertainty of resistance versus frequency. The mean value of resistance is the central diamond, the error bars indicate ± 95 % uncertainty limits and the dashed lines indicate ± 5 % of 50 Ω.

Unravelling the mysteries of connecting radios to antennas

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The transceiver in your radio shack probably came "off-the-shelf", ready to go. But outside the shack, your HF antenna system and its associated feeder arrangements are essentially "home-brew". This comprehensive article, presented in four parts, will give you all you need to get your antennas working the way they should.

Part 1. Antennas and their feed-point impedances

This article is about the practical application of common antenna knowledge. Its purpose is to unravel some of the mysteries that surround getting our signals in from and out to our antennas, reliably and efficiently. It started out as a presentation on baluns – but the more I marshalled my ideas, the more questions arose about the things on either side of the balun. There may be some surprises compared with present-day folklore.

This is not an exhaustive treatise on antennas and transmission lines – I discuss these in sufficient detail that you can make an informed decision about where you would use a balun to best effect, and how you could roll-your-own. My guiding point of departure in this article is that you want to use a single antenna on as many bands as possible without having to reconfigure it each time you change bands.

When we use an antenna over a wide frequency range, the impedance it presents dances all over the place. Yet, there are certain components that work most efficiently and require the least maintenance if they are worked at constant impedance. The balun is one such component in the path from our transceiver to the antenna.

The Jacobi theorem

When the impedances of our transmission line and antenna match the output impedance of our transceiver, we have the maximum transfer of power to our antenna; in other words, our system is at its most efficient and effective. The same applies in reverse, to transfer the received signals from the antenna down to the transceiver.

There are some other considerations (and costs):

- When the voltage and current excursions on our transmission line are the least (low VSWR, impedances closely matched), it is less likely to suffer from flashover (excess voltage) or melting (excess current) and will require less restorative maintenance. If there is an impedance mismatch and we want to reduce downstream maintenance, then we can space the feed-line wires to reduce the likelihood of voltage flashover; or increase the gauge of the feed-line wires to withstand the higher current. However, increasing the spacing increases the feed-line impedance, increasing the mismatch; increasing the wire gauge may stretch the antenna, pulling it out of resonance. And the wind forces on the larger, heavier feed-line may result in dry joints and even breakages where the feed-line meets the antenna.
- When impedance matching is good (low VSWR, small reflected power) our transceiver is less likely to reduce its power output or go into automatic shut- down. Where the transceiver does not have automatic protection against high VSWR, the output stage – valves or transistors – is likely to suffer voltage breakdown effects, and is more likely to require restorative maintenance, thus increasing the cost of ownership.
- When impedance matching is good we are less likely to generate spurious emissions, which in turn means we are more likely to maintain good relations with our neighbours and other spectrum users.
- And when impedance matching is good (best transfer of received power) we will be able to receive signals of lesser level, increasing our enjoyment of the hobby.

Spectrum access for radio amateurs

Internationally, radio amateurs have access to the widest frequency spectrum after the military. For the enthusiastic amateur, this implies a need to use that spectrum to its fullest. One way we try to achieve economies while enjoying wide spectrum usage, is to try to get our antennas to operate over the maximum frequency spectrum; ie, on as many bands as possible.

Many years ago, when the 'traditional' amateur bands (80 m, 40 m, 20 m, 15 m and 10 m) were being allocated, the harmonic relationship of the bands was thought to be of good value to the radio

amateur and a means of ensuring that any unwanted harmonics would affect only those bands.

Unfortunately, because real antennas need to be shortened about 5% from their electrical length, harmonics don't always fall neatly within the amateur bands. I'm talking here of the harmonics of the antenna, not harmonics of the transceiver. If you strike a bell, it rings at its resonant frequency plus a wide range of its natural harmonics – same for an antenna. So, if you stimulate an antenna off its resonant frequency with a harmonic-laden signal, some of your transceiver's harmonics will be attenuated because they fall off the resonance curve of the antenna but some of the harmonics of the antenna will be radiated.

Let me expand this with an example:

Say we want to set up a horizontal dipole for 40 m (eg, 7.25 MHz), and also use it on 15 m. The required active leg length, when operating on its fundamental frequency, can be calculated from the wave formula:

$\lambda = v / f$

where

v = velocity of the wave in our antenna (300×10^6 m / s)

f = chosen operating frequency

λ = wavelength

Substituting known and desired values, we get

$\lambda = (300 \times 10^6) / (7.25 \times 10^6)$

= 41.38 m

Assuming we are using a thin, uninsulated wire in air, the physical length of a 1/4 leg will be:

$0.95 \times 41.38 / 4$

= 9.828 m (the 5% reduction compensates for "end-effect")

Now, we also want to use this antenna on its third harmonic – the 15 m (λ_3) band. Here, that length of 9.828 m corresponds to two full quarter waves and a 5% shortened quarter wave, because the "end-effect" only applies to one quarter wave

Actual length = $(2 \times 0.25 + 0.95 \times 0.25) \lambda_3$

$= 0.7375 \lambda_3$

So, $\lambda_3 = 9.828 / 0.7375$

= 13.33 m

What is the resonant frequency of this dipole leg?

Rearranging the above formula for f, we get

$f = v / \lambda$

= 22.5 MHz

which is outside the 15 m amateur band. This antenna is too short for amateur operations, and would be capacitively reactive on the 15 m band. Alternately, if we use a slightly longer antenna to resonate on 15m, it would be too long for our chosen spot on 40 m and inductively reactive there.

We get a similar problem with the 'harmonic' relationship between 80 m and 30 m, between 17 m and 6 m, and between 2 m and 70 cm.

In the case of a centre-fed vertical dipole, because the lower leg is closer to ground and is therefore more capacitive, it should be shortened even further to counter that effect.

Antenna feed point impedance (Z_{AE}) vs frequency

As shown above, operating an antenna over a wide frequency spectrum has implications for the feed point impedance. This section is not an exhaustive treatment of all antenna configurations; rather, the most popular and economical forms, the horizontal dipole and the vertical quarter-wave ground-plane, are discussed.

Horizontal dipole

When we operate a horizontal half-wave dipole more than a wavelength above ground, at its fundamental frequency, and fed at its centre, its feed point impedance (Z_{AE}) is resistive and about 72 Ω. If we increase the frequency so that each leg of the dipole corresponds to $(2n+1)1/4$ (an odd number of quarter wavelengths), again we find a fairly low resistive impedance, but greater than 72 Ω. If the frequency is such that the length of each leg of our dipole corresponds to $n1/2$ (an even number of half wavelengths), the impedance is again resistive, but very high – it can be in the order of 5 kΩ. At any other frequency, Z_{AE} is not purely resistive.

If we add parasitic elements, as in a Yagi-Uda antenna, or if we fold our dipole, or make several folded sections of different cross-sections, the centre-fed Z_{AE} (although resistive) may vary from as low as 5 Ω up to 500 Ω.

Off-centre fed dipole antenna

If we feed a resonant dipole off centre, Z_{AE} moves from a minimum of 72 Ω when fed at the centre to around 5 kΩ when fed at the end; eg, the Zeppelin design. Non-resonant off-centre fed (OCF) antennas show a moderately high resistive component, 150 to 200 Ω, but may also have a reactive component. When one section is an odd multiple of λ/4 and the other section is an even multiple of λ/4 (the one-third fed version), the antenna will be resonant, but its feed point impedance will be high and unbalanced. When fed at the one-quarter point, we have the possibility of the shorter section being λ/4 and the longer, 3λ/4; this will be a low Z_{AE} antenna, perhaps 100Ω, and this antenna can only be low impedance on its odd harmonics. Feed the OCF at almost any other fraction of its length and Z_{AE} will be reactive.

Vertical ground-plane

For a vertical λ/4 ground-plane antenna, the feed point impedance is a little different from that of the horizontal dipole. The antenna feed point impedance is given by:

$Z_{IN} = Z_{AE} + Z_{GND}$

where:

Z_{IN} = actual input impedance

Z_{AE} = intrinsic feed-point impedance

Z_{GND} = ground impedance

If the antenna is a resonant quarter-wave vertical over a horizontal ground plane, at its fundamental frequency, Z_{AE} is about 36 Ω resistive. However, Z_{GND} depends on the actual architecture of the ground-plane. Broadcasters and the military like to plant their vertical antennas in salty marshland or employ around 160 radials when the ground-plane is kept at ground level. If the ground-plane is lifted above ground by about λ/10 or so, we can get away with as few as 4 horizontal radials. The above-ground system is called a counterpoise.

With a ground-plane anything less than those described above, Z_{GND} becomes quite significant; energy fed into Z_{GND} warms the ground a little but does not radiate. We get a similar effect when we use a VHF/UHF vertical whip on a vehicle and omit to bond all the panels that could form a good ground-plane. If Z_{GND} can be kept close to zero the antenna system efficiency is high and almost all the transmitter output power is radiated.

For example, a four-wire radial system deployed at ground level may have a Z_{GND} of about 10 Ω, depending on the

conductivity of the underlying earth.

So $Z_{IN} = 36 + 10 = 46\ \Omega$

For this antenna system, $P_{OUT} = P_{IN} X$ 36 / 46; ie, about 78% of P_{IN} or nearly 1 dB down.

If the antenna feed point is raised at least λ/2 above ground, and we slope the ground-plane radials down from 90° (horizontal) to around 135°, Z_{AE} becomes about 50 Ω resistive. This only applies at the fundamental resonance. If we continue to bend the radials down to 180°, we get a vertical dipole with a Z_{AE} of about 72 Ω. So, reorienting the radials alters the impedance. When the feed point of a vertical dipole is higher than about 0.4λ above ground, Z_{AE} stays fairly close to 72 Ω.

Thus, the feed point impedance of that λ/4 vertical you have stuck on the roof or bull-bar of your vehicle is unlikely to be 50 Ω – it'll be more like 36 Ω; so, why use 50 Ω feeder cable?

As with the horizontal dipole, at frequencies that are odd multiples of λ/4, Z_{AE} of the quarter-wave ground-plane antenna is resistive but higher than 36 Ω. At frequencies that are exact multiples of λ/2, Z_{AE} is resistive but very high – possibly several kΩ. At any other frequency, Z_{AE} is complex; ie, not purely resistive.

A few words of warning about radials:

- At resonance, the ends of the radials remote from the antenna's feed point have very high impedance and are therefore at very high voltage. Good quality ground-planes, or counterpoises, have a large blob of insulating material on the free ends to reduce the likelihood of electric shock or radiation burns. If you make your own counterpoise, insulate the free ends appropriately. If we assume that the free ends have an impedance of say 2.5 kΩ (a conservative estimate) and we feed 400 W into the antenna, what voltage is developed there?

  Power law $P = V^2 / R$

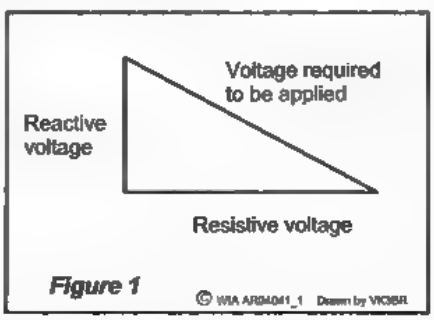
  Rearranging for V, we get

  $V = \sqrt{(P \times R)}$

  Putting in our values of 2.5 kΩ and 400 W, we find that 1 kV is developed.
- Attempting to use the earth as a ground-plane in Australia is asking for trouble – the earth's conductivity is, in general, rather too low. I have seen a vertical ground-plane antenna where one side of the feed-line was connected to an earth spike. Full stop. And the owner/erector wondered why his signal was just about receivable next door, and a VSWR anywhere near 1:1 was unachievable.
- I have also seen counterpoises deployed where the free ends were attached to earth spikes. When the counterpoise is odd multiples of λ/4 long, and the free ends are grounded, Z_{AE} becomes very high, along with the VSWR (the quarter-wave transformer effect). When the counterpoise is any even multiple of λ/4 long, and the free ends are grounded, Z_{AE} approaches zero along with high VSWR (the impedance of a half-wave feed-line is the same at each end). Either way, the feed-line gets stressed and little signal gets in or out.
- If you feel bound to earth your counterpoise, say for lightning protection purposes, only do so near the antenna feed point. In fact, you may need quite an array of earth leads to cope with the tens of kiloamps likely to be carried to earth if your antenna is struck – but keep your lightning protection earth separate from your antenna earth.

Complex impedance

Whenever the feed point impedance is not purely resistive, this means that to deliver a certain amount of power, we need to feed a higher voltage than if the antenna were purely resistive: This is illustrated in Figure 1 below.



Only the power absorbed by the resistive component of the antenna is radiated. So we ought to do something about reducing the reactive component of the antenna impedance, preferably to zero – but more on that later . . ..

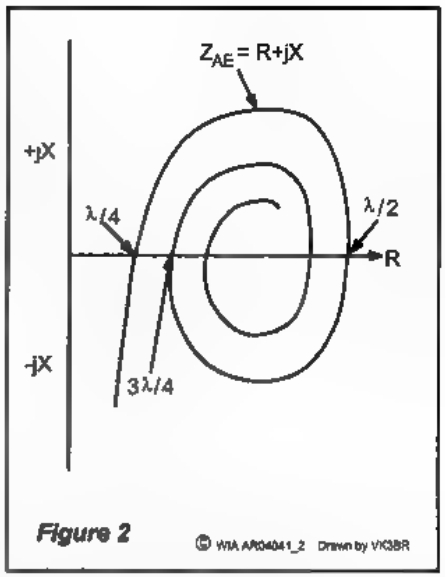


Fig 2 – Feed-point impedance of a fixed-length antenna.

Figure 2 shows how the feed point impedance Z_{AE} changes as the frequency applied to a fixed-length antenna is varied. Its reactance is positive (+jX, inductive) at some frequencies and negative (–jX, capacitive) at others, but the resistive component (R) is always positive.

If you measure the complex impedance vs frequency of your antenna just after you have erected it, you can generate your very own impedance spiral; these data will be invaluable for future diagnostics and preventative maintenance.

Z_{AE} vs antenna height

In the previous section, we assumed that our antenna was a great distance away from any other disturbing objects. At the lower frequencies (longer wavelengths), for most of us this situation is clearly out of the question. We have to deal with buildings constructed of conducting materials, built on odd-shaped and small blocks of land in suburban, built-up areas. We also have to comply with Building Application and Development Application approvals, and maintain harmonious relations with our spouses and the neighbours.

So our antennas, in the main, are limited to 'reasonable' heights, which often means less than 10 to 20 m above ground. When we operate a resonant, horizontal dipole antenna at less than λ/3 above ground, the feed point impedance is very low, and falls almost linearly to zero as the height reduces to zero. To apply this rule to a resonant λ/4 vertical

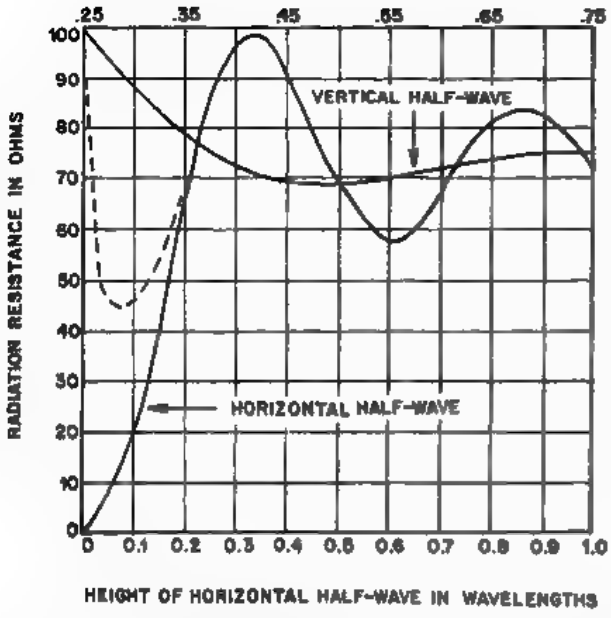


Fig 3 – Feed-point impedance vs antenna height (Fig 16, p3-11 from ARRL Antenna Handbook 1991

ground plane antenna, substitute 'the height of the feed point' for 'height' in the previous sentence.

At the frequency for which the antenna height is 0.18λ, the feed point impedance of a horizontal dipole is about 50 Ω – and that is the only frequency at which this happens. As the height in wavelengths is increased, the feed point impedance oscillates between about 60 Ω and 96 Ω. As the height increases further, the feed point impedance asymptotes to about 72 Ω. These characteristics are plotted in Figure 3 below - note that the oscillation period seems to be about λ/2.

Why do we worship 50 Ω?

There is nothing magical about 50 Ω. It just happens to be a commercial/military solution to a logistical problem. When coaxial cable was invented, the ideal characteristic impedance for use with a horizontal dipole was 72 Ω; and that for use with a quarter-wave vertical ground-plane antenna was 36 Ω – and, strangely, they still are. The cable's characteristic impedance can be changed in the factory by changing the ratio of diameters of the inner and outer conductors, although 36 Ω coaxial cable is a bit difficult to manufacture. But in the field, it can be quite difficult to determine what the characteristic impedance of a cable is. The easy way out was to choose a characteristic impedance that gave the minimum regret. Now the geometric mean of the two contenders is √(36 X 72) – 51 Ω. So, if 51 Ω cable were deployed everywhere, the maximum VSWR with horizontal dipoles (eg, radar and aircraft height gauges) and vertical whips (eg, communications) would be about 1.4:1 – quite acceptable then as now.

Summary of Part 1

We can't alter the laws of physics that govern the relationships between wave velocity, frequency, wavelength, voltage and current in our antennas. The best we can do is to understand them, then adjust the length of the active legs of our antennas and adjust our methods of feeding them to maximise our $ effectiveness and enjoyment. We can measure the lengths of the various active parts of our antennas; we can observe their proximity to potential absorbers, reflectors and re-radiators and make educated adjustments. How to deal with the voltage and current matters, I will come to later.

The main points are:

1. A Z_{AE} of exactly 50 Ω resistive for an antenna is most unusual – it occurs in only a very few specialised situations. Depending on antenna configuration and the position of the feed point, Z_{AE} can vary between 5 Ω and 5 kΩ.
2. The Z_{AE} of any antenna, the length of whose active parts corresponds to a multiple of λ/4, is resistive and resonant. At any other frequency, Z_{AE} is reactive; and the antenna has a lower effectiveness and efficiency – less signal gets in and out, and it costs us more to feed and maintain.
3. When the lengths of the active legs of an antenna correspond to (2n + 1)λ/4, then Z_{AE} is low.
4. When the active leg lengths of an antenna correspond to nλ/2, then Z_{AE} is high.
5. The active leg-length calculations for resonance must take end-effects and ground-effects into account.
6. Apart from lightning protection, there is really no need to earth a ground-plane/counterpoise.

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- *ARRL Handbook* – any recent edition should do
- Kraus, John D. *Antennas*, McGraw Hill, NY, NY (1988)
- Shrader, Robert L. *Electronic Communication*, 5th edition, McGraw Hill, NY, NY (1985) ch. 20.

Part 2 of this article in next month's *Amateur Radio*

A pi-coupler for the compact 160 m vertical (and HF antennas)

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In a recent article (Jan/Feb AR) outlining the construction of a compact loaded vertical antenna for 160 m, it was declared that a coupler/ATU will be necessary at the transmitter end of the line to obtain an efficient match. When said vertical is operated over the larger portion of 160 m, it is found at some point in the band that the required LC network swaps from needing to be: capacitor on the transmitter side of the coil to: capacitor on the line side of the coil (Reference 1. See also 2 and 3). A pi-coupler is ideally suited to this job, because it can be made to operate in, and between either configuration, and thus match a wide range of impedances.

It is interesting to note that many of the commercially-made automatic ATU/couplers, and at least one RSGB pattern now employ the pi configuration, rather than the recently popular T-match and SPC networks. Although the T-network is theoretically capable of matching a very wide range of impedances to (the usual) 50Ω, in some circumstances it is possible to develop quite high voltages across the capacitor(s), and high currents in the coil of the T-network, which may, in turn, limit the amount of power that can be passed through the coupler (Reference 4).

Provided that the input and output capacitances of the pi can be made as large, or as small as necessary, and that a tapped or roller-inductor coil is used, the pi is capable of matching our 50Ω to high and low impedances, such as may be presented at the station end of random wire and long-wire antennas worked against ground (References 5 and 6).

The pi-coupler is also of great value in allowing, for example, a dipole that is resonant at (say) 3.6 MHz to be operated up on the "DX window" near 3.8 MHz, or down in the CW segment near 3.5 MHz. Placed conveniently in the coax at the station end of the line, the coupler may be adjusted so that the transmitter's output amplifier always "sees" a load that is close to 50 Ω resistive. The SWR on (or in) the line between the coupler and the antenna feed-point remains unchanged of course, and may be as high as 2.5, or even 3 to 1. Nevertheless, at HF,

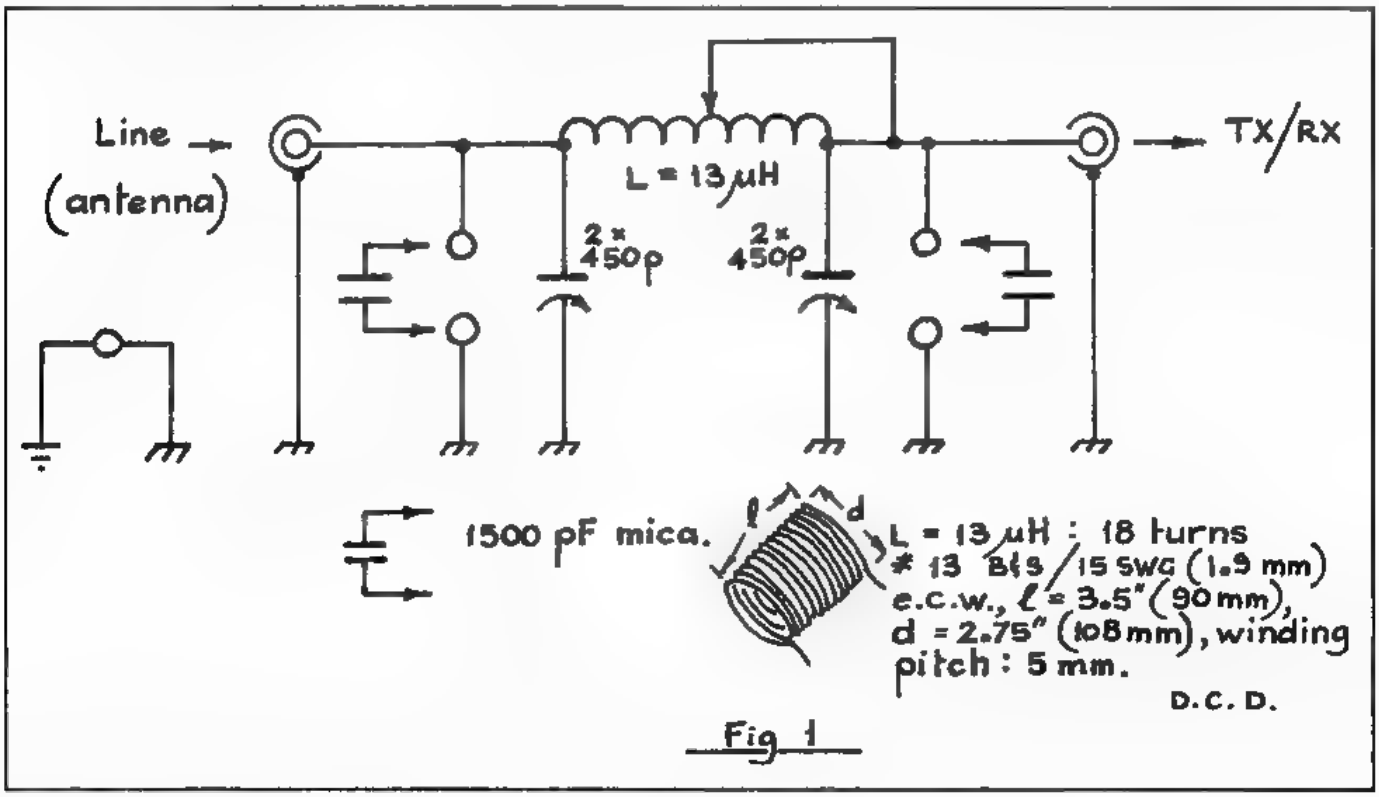

Figure 1

any additional loss in good-quality coax would remain acceptably low. Similar for a dipole cut for the middle of our 7 MHz band.

Circuit

See Figure 1. The frequency response of a pi-network is that of a peaked low-pass filter (Reference 7). The pi therefore offers additional useful attenuation of any harmonic energy present at the transmitter's output.

The only theoretical limitation on the network values (shunt capacitances, and the series inductor) is that the inductor's reactance may be no greater than the square root of the product of the two impedances that are to be matched (Reference 5). In practical terms therefore, it must be possible to adjust the coil's inductance, in this instance from a fraction of a microhenry (µH), to about 12 µH or 13 µH, for use with the compact vertical and/or antennas for 3.5, 7 and 10.1 MHz.

Ordinary Australian 2-gang broadcast variable capacitors have a maximum value per section of about 450 pF, so two gangs wired in parallel per C element gives us 900 pF each side of the coil. Depending upon the nature of the impedance presented to the coupler at the station end of the line, a capacitance of more than 900 pF is sometimes required on either the input, or output, side of the coil. A pair of binding post terminals (or banana sockets) allows an additional fixed mica capacitor of about 1500 pF to be connected across either variable capacitor, thus increasing the range to about 2400 pF on either the input, or output, of the coupler.

For the inductance element, a coil of about 13 µH maximum is required. It may be a roller inductor, or tapped coil, where the unwanted portion of the inductance is shorted with a crocodile clip-lead, as shown in figure 1. It is common practice to do this - for it reduces the possibility of parasitic resonances, and prevents "step-up" or "Tesla coil" effects - where the unused portion of the coil may have disastrously high voltages induced in it.

Some builders are uncomfortable with the notion of shorting unused portions of a solenoid coil (like this one) - a lurking suspicion that shorted turns will incur a loss. We must remember however, that there is considerable flux leakage. That is, the coefficient of coupling for an air-wound coil is substantially less than one.

Shorted turns have much less effect on the total self-inductance than would be the case for a power transformer with an iron core, where shorted turns are a calamity. By shorting the un-used part of the coil, we reduce the inductance of the remainder by only a tad more than would be the case had turns simply been removed by some other mechanism. Any additional loss will be very small provided that the "short-circuiting" is done via a very low resistance path (Reference 8).

Construction

The solenoid coil and two, 2-gang variable capacitors may be accommodated upon a 170 mm wide U-shape chassis, something along the lines of that shown in Photo 1. The 40 mm high rear panel supports the input and output coax connectors, and a chassis binding post terminal (photo 2) for connection of earth/ground - required only for wires worked against ground.

Depending upon the height of your variable capacitors, the front panel may be about 110 mm high. Chassis depth is 210 mm. Most B/C radio type capacitors have a 3/8" shaft, so some sort of adaptor is usually needed to permit a standard 1/4" shaft and knob to be fitted. Illustrated in Photo 3 is an improvised coupler made from a length of ordinary 1/4" i.e. rubber fuel hose. To fit the hose on to the 3/8" shaft, carefully cut two 3/4" long slits at right angles along the longitude.

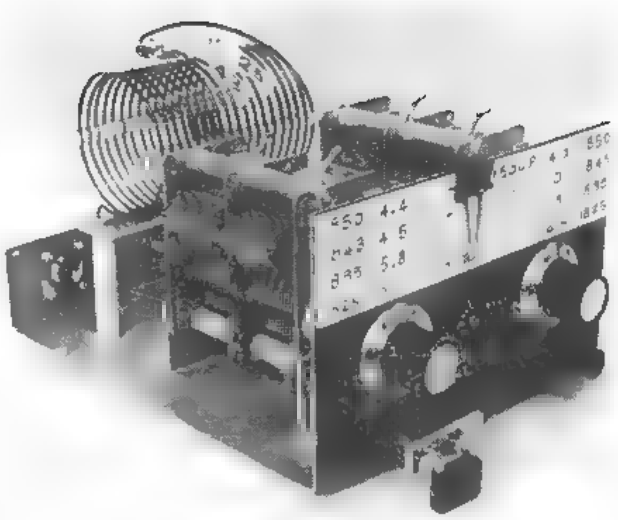

Photo 1

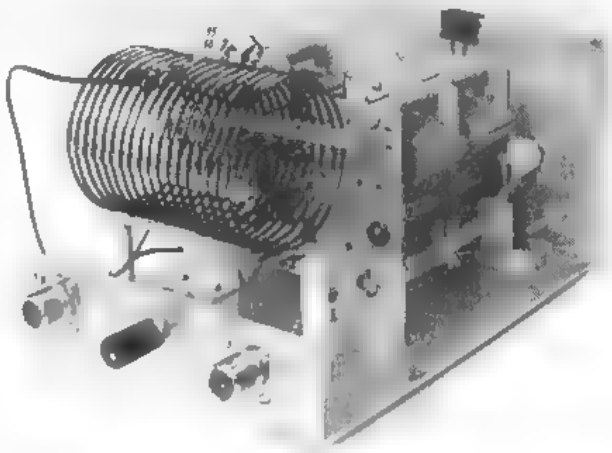

Photo 2

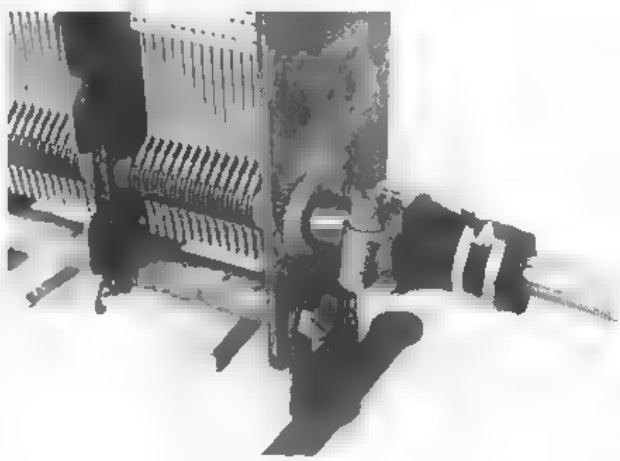

Photo 3

The hose is pushed onto the shaft, and fixed there with a worm-drive hose clamp. An appropriate length of 1/4" (6mm) rod is inserted into the hose and clamped similarly, as shown. A bush, salvaged from a defunct potentiometer may be installed into the front panel so

Photo 4

that the shaft rotates smoothly without eccentricity.

The coil may be any well-made solenoid of about 13 µH or 20 µH, with provision for tapping into every turn. A roller inductor of similar inductance would also serve. Some rollers have one end of the coil connected to frame. Check for this, and disconnect or insulate as necessary. A suggested method of making a high Q, 13 µH coil was described recently (Reference 9). The enamel insulation must be removed from a small section near the top of each turn to allow connection of the clip lead. The coil should be mounted upon insulated rods so that it is distanced from metal objects as far as reasonably possible, as illustrated in the rear view, Photo 2.

Binding post terminals, or banana sockets are ideal for receiving the additional plug-in capacitor. A standard spacing of 0.75" (20mm) is advised. Pictured in Photo 4 is a suggested method of accommodating the additional 1500 pF (or thereabouts) mica capacitor, which is soldered to two banana sockets fitted into threaded holes in a suitably sized rectangle of Perspex (or similar) insulating material.

Operation

Connect an SWR meter between the transmitter/receiver and the coupler. Adjust all three variables initially for maximum received signal (or noise). When used with the short 160 m vertical and perhaps 20 m of RG-8 coax line, taps about half-way along the coils are required. It should be found that one cap will be meshed, and the other un-meshed - or partially meshed. If one cap is at full mesh - more capacitance is perhaps required; try plugging in the additional 1500 pF mica cap and re-adjust.

When the coupler appears to be at optimum adjustment, on a clear frequency, apply the smallest tuning signal that your SWR meter will respond to. Carefully re-adjust the caps and coil tap positions (do not touch the coil whilst transmitting) for lowest SWR. All being well, it should be possible to achieve a very low SWR. Repeat for every frequency of interest. Coil tap positions may be recorded by attaching a suitably marked bread-bag closer onto relevant coil turns, as illustrated in Photos 1 and 2. A rectangle of white Laminex (or similar) material is ideal for recording the variable settings in tabular form.

For use with antennas on 3.5, 7 or 10.1 MHz, operation is similar to that described above. All three variables are plied. Capacitor adjustment is much sharper however. At HF it will be found that very little of the coil inductance is required, needing only a few turns at 7 MHz and 10.1 MHz.

A good radio earth/ground must be connected to the coupler's chassis for use with random/long wire antennas. Wires that are a half-wavelength long, or multiple, will present high impedance to the coupler, and problems with flashover (of an ordinary B/C capacitor) may occur. The antenna may simply be shortened, or lengthened, by perhaps two or three metres to bring the impedance back to a moderate value, and thus allow greater power to be used.

Parts

Second-hand B/C capacitors (in my experience) are nearly always obtainable at radio club swap meets. The usual price is around $4 for good ones. To handle RF current and voltage, the additional 1500 pF capacitor(s) must be a mica type. If you have trouble locating one (or two), please write to me at the address shown, enclosing a $1 SASE, whereupon you shall receive two 1500 pF/600 V micas by return post.

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More information on the VK5BR_X3 antenna

(Including detail for an 10 metre and 80 metre version and an alternative 20 metre version)

Lloyd Butler VK5BR

The following adds to information published in previous issues of *Amateur Radio* concerning the VK5BR_X3 antenna and which included detail for 20 and 40 metre models of the antenna. Further detail is now given for 10 metre and 80 metre models and also an alternative assembly for the 20 metre model.

The idea of this antenna (and in fact other crossed field antennas) is to provide interaction between the E and H induction fields in a similar form to what they must be when part of an EM wave. That is, they are set up to be in phase and at right angles to each other. This apparently improves the coupling of energy into the EM wave and the effect shows up in the small antenna as an increase in radiation resistance and ultimate increase in radiation efficiency. The article includes measurements taken to demonstrate this result.

The complete tuning and matching system for the X3 antenna is recalled by the diagram of figure 1. For more detail, refer to the previous articles in Amateur Radio.

The 80 metre X3 antenna

The 80 metre antenna is similarly constructed to the 40 metre version described in my previous article with the same square galvanised pipe sections for the E Field plates but extended to 90 cm in length. The coil diameters have been increased to 110mm with an aim of obtained values of Q approaching 400. The high Q was considered necessary to achieve high efficiency on this band with such a high capacitive reactance across the plates. The assembly information, not drawn to scale, is given in figure 2.

Whilst I have advocated open wire line for the tuneable feeders of the higher frequency antennas to minimise transmission loss, I consider ordinary "figure of 8 power flex" quite good enough for 80 metre operation providing the feeder line is not too long.

I measured the characteristic impedance of some of this cable and found it to be around 110 ohms. I measured the transmission loss in 15 metres of cable terminated in 50 ohms which represented a fair degree of mismatch. The transmission loss was a mere 0.6 dB. Operating the line in the tuned mode with the X3, the mismatch would probably be much worse than this but hopefully one would aim at a lesser length of line.

Some brief tests using the field strength meter indicated similar characteristics to the higher frequency antennas which demonstrated higher field strength skewed towards the ends of the dipole plates and lesser field at right angles to the line of the plates. Later tests have indicated that this is a characteristic of the near field (or induction field) and at distance, the strongest signal occurs when the antenna line is at right angles to the direction of transmission.

A comparison in signal strength was recorded between the X3 antenna mounted in the vertical plane at a height of 1.5 metres and a 5/8 wavelength long wire antenna resonated against ground. A station 2 km away recorded the X3 antenna as one S point below the wire antenna.

An alternative 20 metre assembly

In a previous article, I showed an assembly for the 20 metre X3 antenna using cylinders for the E plates. Based on the method of assembly used in the 40 and 80 metre antennas, an alternative 20 version of the X3 antenna has since been made as shown in Figure 3.

The capacitance between the plates for the new model is lower than that of the previous model and using the same coils gives a natural resonance somewhat higher than 14 MHz. To compensate for this, the inductance of each coil (previously 6.3 µH) was increased to 7 µH using 11 turns on a 60 mm PVC former.

X3 antenna for 10 metres (Figure 4)

A 10 metre antenna has been assembled so that, with the shorter wavelength, some tests could be carried out within the suburban backyard but outside of the near field region. The antenna is constructed on similar assembly lines to the lower frequency versions shown in figures 2 and 3.

The dipole legs are made of 19mm (3/4 inch) square brass tubing which I had on hand and each leg is 170mm long. The legs are separated by a gap of 30mm.

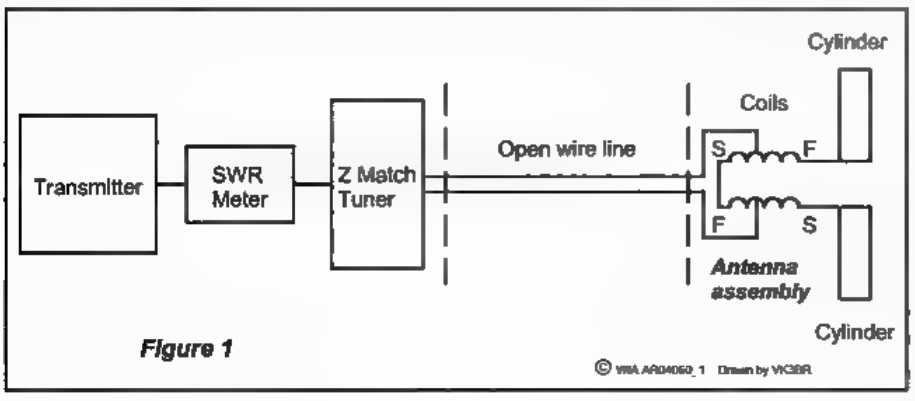

Figure 1

The two coils are each 12 turns, tapped at 3 turns and wound on 34mm PVC round tube which is cut to 65mm length. They have an inductance of 3.5 µH. The two coils in series resonate with the dipole capacitance within the 28 MHz band.

Two Plexiglas plates 95mm x 85mm are screwed to the square dipole plates to secure them apart and provide a mount for the two coils similar to the assembly in the lower frequency antennas. The coils are bolted through 10 mm spacers to the plates.

I have carried out a lot of performance testing on Z Match Tuners, but not on 10 metres. Hence there was a question of how well they might work with the X3 system at 10 metres. My Single Z Match unit matched up OK and appeared to be working efficiently. Operation with a short length open wire line within the radio shack produced a little bit of current unbalance in the legs of the line. However the currents balanced up quite well with the antenna mounted outside and connected by a longer length of line. I was unable to get a satisfactory match using my Two Coil Compact Coil (Rononymous) Z Match Unit.

Using the 10 metre X3 antenna and a field metre, I was able to confirm that outside of the near field zone, best radiation occurred when the antenna was mounted vertical and that it appeared vertically polarised.

Radiation efficiency

The ultimate test for the antenna is its radiation efficiency or the ratio of power radiated to the power fed its input terminals. One way to evaluate this efficiency is to consider the ratio between the total series load resistance Rt and the series loss resistance RL which is mainly due to the RF resistance of the series coils.

I discovered an easy way to get this ratio for the X3 antenna. The resistance component at the input terminals to the coil taps is first measured to give a value Rta with the antenna circuit at resonance. The antenna plates are then disconnected and replaced with a capacitor of such value as to again bring the circuit to resonance. A new value of resistance component RLa is read. Juggling some mathematics, I discovered that the ratio RLa/Rta is the same as the ratio RL/Rt and that the efficiency can be derived as:

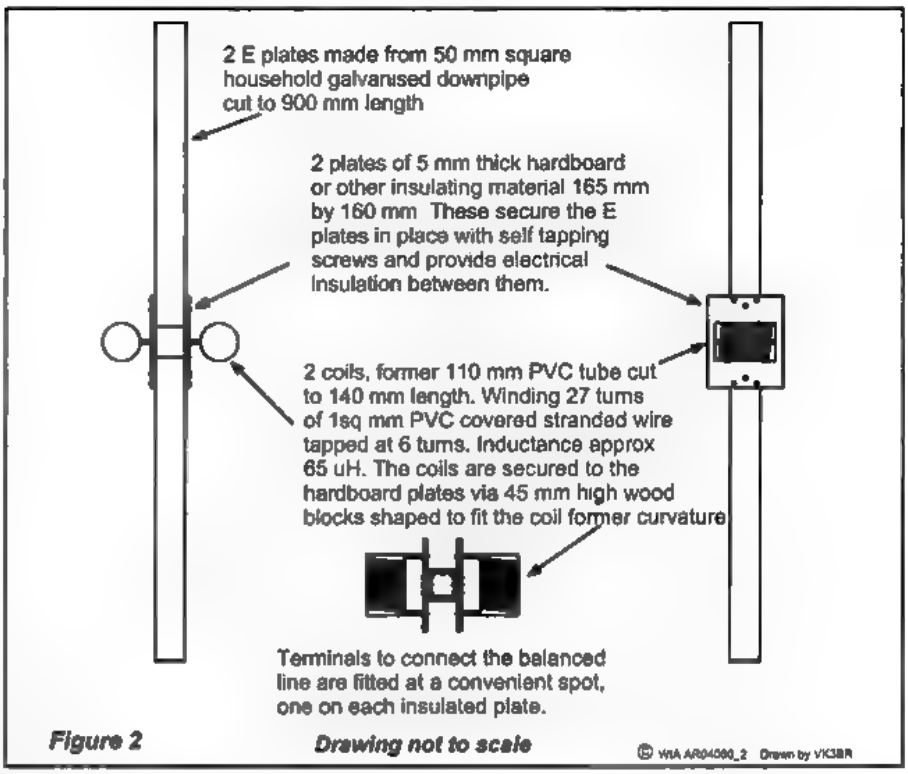

Figure 2

Efficiency = 100(1 - RLa/Rta)%

Values of Rta and RLa vary quite a bit with actual frequency and the proximity of objects near to the antenna but typical measured values and the efficiency which results are given for the three X3 antennas I have assembled (In the case of 20 metres, the results are those obtained using the original 20 metre assembly as described in my first article):

20 metres - RLa = 7 ohms Rta = 90 ohms
Efficiency = 92%

40 metres - RLa = 6 ohms Rta = 80 ohms
Efficiency = 92%

80 metres - RLa = 6 ohms Rta = 62 ohms
Efficiency = 90%

Comparison to a simple dipole

We now compare the above efficiency with a simple dipole of similar dipole length as the 80 metre X3 and operated on 80 metres with the same loading coils as used in the X3.

A well known formula for the approximate value of radiation resistance in a simple shortened dipole is as follows:

$Rr = 320(\pi Lr/\lambda)^2$

where Lr = Effective length in metres and λ = wavelength in metres

$Lr = 2L/\pi$, where L is actual length in metres

Hence $Rr = 320(L/\lambda)^2$

The length of the X3 is about 2 metres so $Rr = 320(2/80)^2 = 0.2\ \Omega$

The RF resistance (RL) of the two series coils in the X3 has been derived as 10 ohms.

So efficiency for the simple dipole can now be derived as:

$100[Rr/(Rr + RL)\ \% = 100[0.2/(0.2 + 10)] = 2\%$

The calculations of efficiency for the X3 antennas are based on losses in the antennas in isolation with their loading coils. Added to the losses are the losses in the transmission line and losses in any matching unit in the radio shack. In the case of the X3, this includes the Z Match tuner.

Tests on the 40 metre antenna with 50 watts of power fed to the antenna have shown that the coils run cool, demonstrating again that little of the power is lost in the coils.

To offset one claim that the power is consumed in common mode radiation, the currents in the two line legs feeding the antenna were measured to be equal and no common mode current was detected by coupling the line pair through a toroidal cored current transformer.

There is just no evidence of any appreciable common mode current

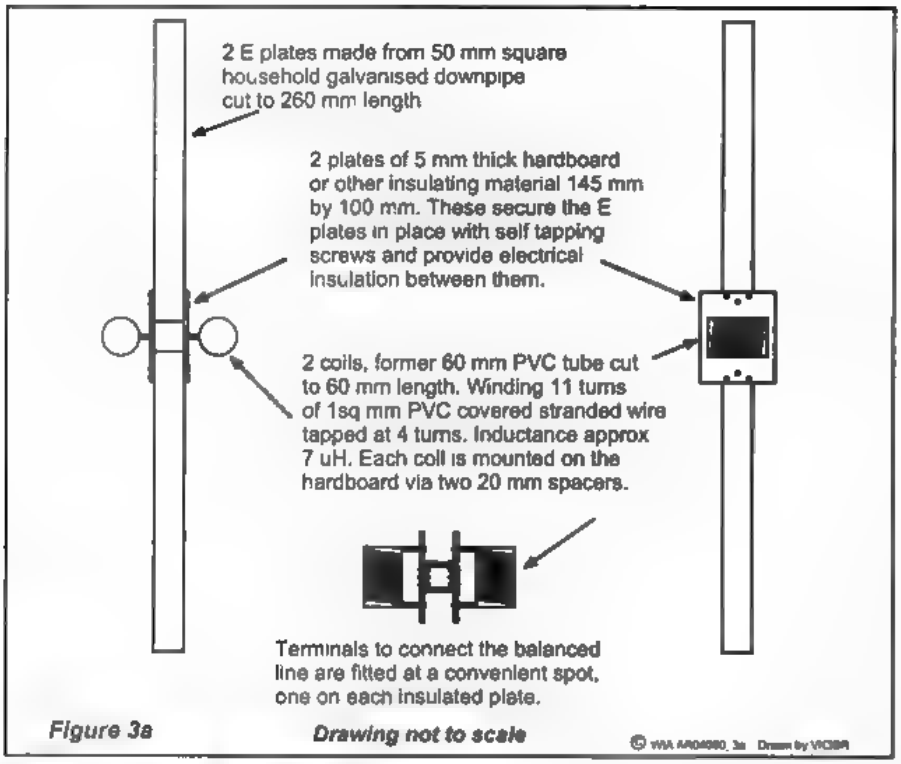

Figure 3a

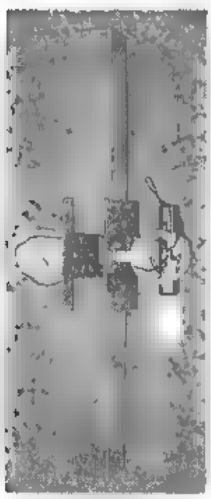

Figure 3b

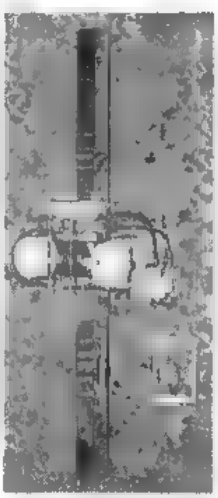

Figure 4

running down the open wire pair in this antenna.

Some notes on field interaction

In the X3 antenna, the coils are orientated so that the line of maximum magnetic field intensity through the centre of the coils is at right angles to the E field between the plates. Someone suggested that we could prove the validity of the interaction between the two fields by simply rotating the coils by 90 degrees so that this field line was no longer at 90 degrees to the E field.

However in doing this, I found the antenna was still able to operate. The explanation of this is shown in figure 5 which shows a typical magnetic field around an open coil. The field at points (1) through the centre of the coils is the strongest but the lines curve and at points (2) there is still a strong field at right angles to (1). The presence of these fields and the line they follow for (1) and (2) are easily proved out using the test device shown in figure 6.

But there is one test which demonstrates the interaction which takes place between the H field from the coils and the E field from plates. Using a field strength indicator at some distance from the X3 antenna shows a concentration of the field in a line with both plate ends. Reverse one coil by 180 degrees so that its field is reversed and the field is concentrated at one plate end.

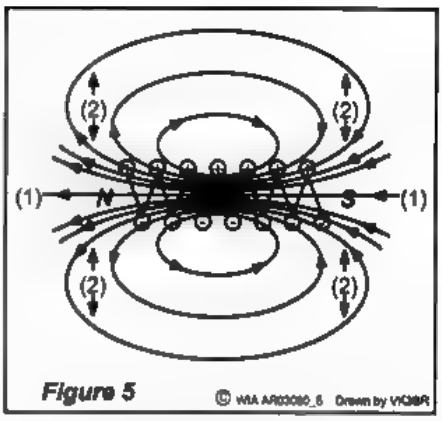

Figure 5

It was suggested that this could simply be caused by the mutual inductance between the coils. However the coils are so far apart that mutual coupling is very small. To check this out, I measured the combined inductance with the two coils in series and could not find any difference in the reading when the one coil was reversed.

Summary

Models of the X3 antenna for 10 metres and 80 metres have been added to those previously published for 20 and 40 metres. An alternative assembly for the 20 metre model has also been added.

Various test details have been given, including measurements to demonstate the effect of radiation resistance increase which takes place in the X3 antenna due to its field interaction and the resultant improvement in radiation efficiency.

References

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Or link from:-
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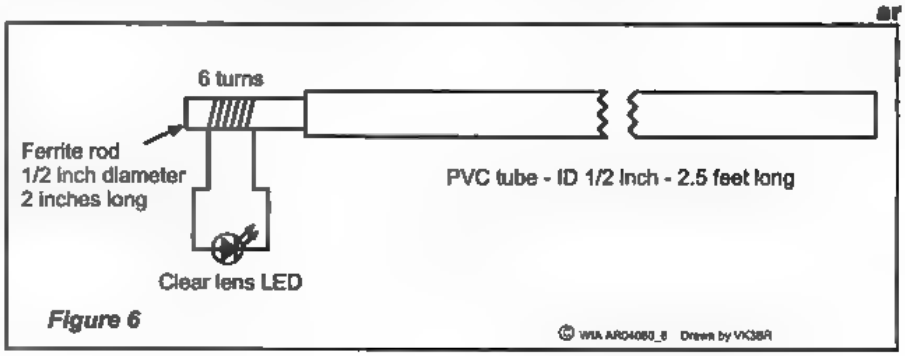
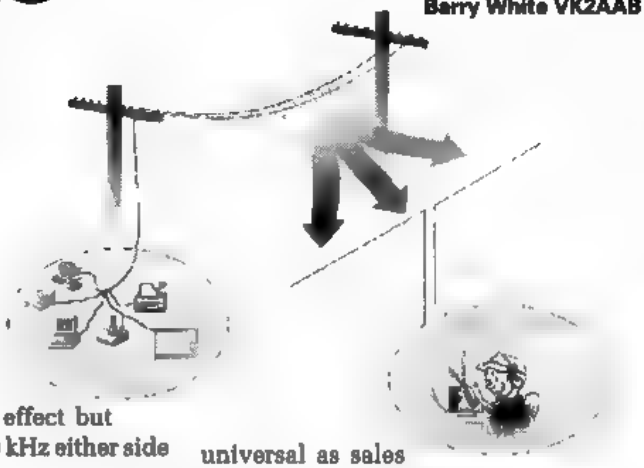


Figure 6

A primer on power line carrier systems

Barry White VK2AAB

I have collected the information here for my own use as well as other interested radio amateurs and any others endeavouring to understand the technology and implications of PLC. The initials PLC, PLT and BPL all mean the same thing – broadband data transmitted over the power lines using radio frequencies in the range 1.4 MHz to 80 MHz. There are two system arrangements. One is for in-building usage and the other, known as the access system, is used between the electricity substation and the customer premises.



Technical information on the various proprietary systems is difficult if not impossible to obtain. The only information admitted by the companies supplying the equipment is that they operate in the range between 1.4 MHz and 80 MHz, and that various modulation systems are used. There are a number of manufacturers and the majority appear to use the DS2 chipset manufactured by DS2 of Spain.

MainNet confirms it uses spread spectrum and it has been determined independently that they use sequential frequency stepping. Their signals sound like a crackling noise no matter where the signal is tuned. The frequency band used is uncertain. It is believed by ARRL to be from 5 MHz to 25 MHz with continuous coverage over that range. MainNet feeds the signal directly into the customer premises.

Ascom and Mitsubishi Electric use ODFM with multiple carriers using the DS2 chipset. It is likely that Ascom equipment is re-badged for other suppliers. The down link uses 2 to 12 MHz frequencies with centre frequencies of 2.4, 4.8, 8.4 and 10.8 MHz for the path to the customer and 19.8, 22.8 and 25.8 MHz centre frequencies for the uplink. The bandwidth of each of these signals is one Megahertz. However these frequencies are nominal as the equipment now being deployed in the US can be moved to avoid interference or to fit their own band plan.

These signals produce multiple carriers 1.1 kHz apart all across the spectrum used.

However the 1 MHz bandwidth for each centre frequency does not end in a "brick wall" filter effect but decreases over about 150 kHz either side of the signal.

HomePlug 1.01 is a company standard. It uses 3 MHz to about 24 MHz. It has 30 db notches in all amateur bands except 60 metre. These notches are not quite enough to provide protection in RF quiet neighbourhoods when the power lines are close to the antenna. This equipment is intended for use in in-house networking of two or more computers.

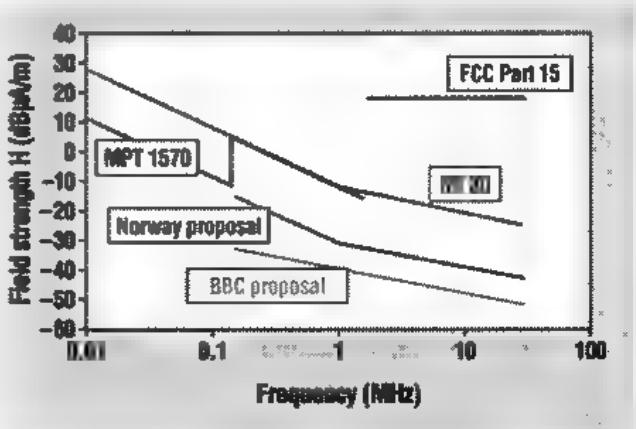
There are significant frequency allocation problems in trying to avoid amateur bands and the same time avoid significant commercial frequencies such as for aircraft and shipping. This is complicated when repeaters have to be inserted into the path and a different group of frequencies needs to be used. If short wave broadcast frequencies have to be avoided then an impossible allocation problem exists. In addition in house systems such as Home Plug frequencies have to be avoided. The Ascom system uses a different group of frequencies in the customer premises with a translator fitted into the power meter box. This further complicates the allocation problem. There is no certainty this arrangement is universal as sales brochure diagrams do not always show that arrangement.

Standards

One of the advantages of standards is that there are plenty from which to choose. This is rampant in the PLC field. In Europe a standard called NB30 is in use in Germany. In the US the suppliers are using the FCC Part 15 rules as they are more liberal that NB30. In the UK there has been no decision on a standard and the trial installations are operating under no standard.

However while all these standards produce strong interference the manufacturers are pressing for higher power levels.

At the Power Line Communications Conference in Sydney in July 2004



Graphic courtesy Dr Diethard Hansen & Compliance Engineering

The BBC and Norway are pressing for much lower standards.

the ACA stated that they would not be introducing a unique standard for Australia but would adopt one of the overseas standards sometime in 2005

One of the difficulties is that all existing standards were written for a point radiator and not for a device with a significant antenna connected so that the signal may be stronger at a place many wavelengths from the transmitter.

The whole scene is a mess of non-compliant systems that exceed the various standards on many typical installations. There is no agreement anywhere on exactly how the radiation from the PLC system should be measured. In the US the National Transmission and Information Authority suggests that measurements are taken along the power line until the highest radiation point is found. Other suggestions are at certain wavelengths from the transmitter and others at the transmitter.

It is starting to be evident that an irreconcilable position is being reached.

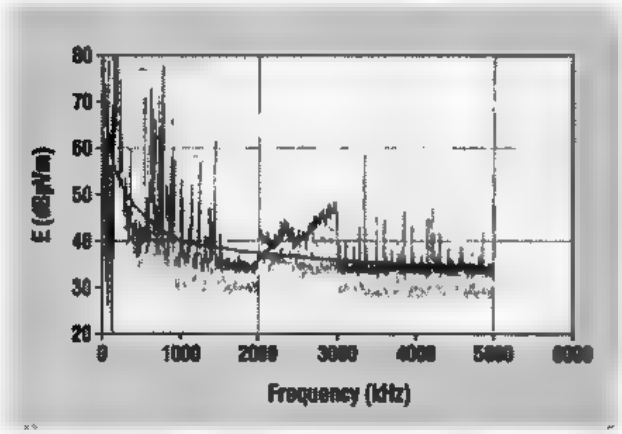
The interference level is too high and radio users are demanding lower levels and the PLC companies are demanding higher levels because a reliable service cannot be maintained at current power levels.

Installation differences

In Europe in most cases the power mains are underground cabling, sometimes in armoured cable. Certainly in older installation the Armour is a woven metal sheath. It is possible in more modern installations that the outer sheath is plastic. The underground installation reduces the radiation from the mains cable significantly but unfortunately not enough.

In the US the mains is distributed in three phases but a street may only have two of the phases plus neutral. Because the customer only has 110 volt, pole transformers are used every three or four houses. Because of these transformers the PLC signal has to get around the transformer. Some sort of filter bypassing around the transformer is employed between the higher voltage supply and the 110-volt lines. Earlier some concern was expressed about the risk of failure of these bypassing devices in the event of lightning strike or other failure. In such an event some thousands of volts would be fed to the domestic premises. No mention has been made of this concern in recent times. MainNet claim that they do not need these bypass filters as their signal can get through the transformer. How they do this is not revealed but the only logical way would seem to be by the use of higher RF power and relying on capacitive coupling between primary and secondary.

Some installations are using WiFi 2.4 GHz links from the transformer to the PLC customers. This approach may have been used because of the cost of bypassing the transformers and providing interface equipment at the customer mains box to connect to the in house system where the customer uses HomePlug.

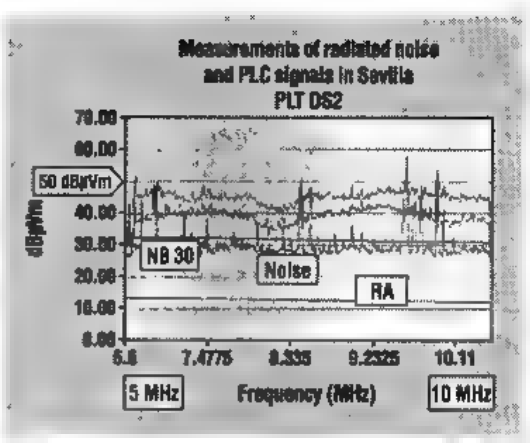


Graphic courtesy Dr Diethard Hansen & Compliance Engineering

Figure 1. Siemens/RegTP 2001 (Cologne) PLC field trials, +17 dBm, PLC Carrier 2–3 MHz, radiated emission (13 dB over NB 30 with high background noise).

So far only one access system has been installed in Australia. The system is operated by Aurora Energy in Hobart and is supplied by Mitsubishi Electric. It is an underground installation to four houses near the Aurora office. Only a very brief listen on a portable receiver during an inspection visit was possible. Further tests will be made at a later date.

Access systems in Australia are likely to follow the methods used



Graphic courtesy Dr Diethard Hansen & Compliance Engineering

Figure 2. PLC radiated emissions about 20 dB over NB 30 RA UK MPT 1570 old limits, –20dB below NB 30 (Source: PLC Forum WS 2001 Brussels).

These graphs show the PLC signal level typical of many PLC installations.

in Europe due to the similarity of the electrical system except that as the mains are generally on street poles the noise level will be higher. Direct feed to the customers PLC modem is thought to be the method intended. However there are interference problems where in house HomePlug equipment is used. The HomePlug equipment is available from both Dick Smith and Harvey Norman stores.

I am indebted to Diethard Hansen HB9CVQ/DK2VQ and Compliance Engineering magazine for permission to reproduce the graphs. The complete articles by Diethard are given in the references.

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http://www.euro-emc-service.de

Technical abstracts

Peter Gibson VK3AZL

Surface mount test tweezers

In Hints and Kinks in QST for November 2004, Dean Poeth, K8TM describes a simple tool that allows rapid sorting and testing of unmarked surface-mount components.

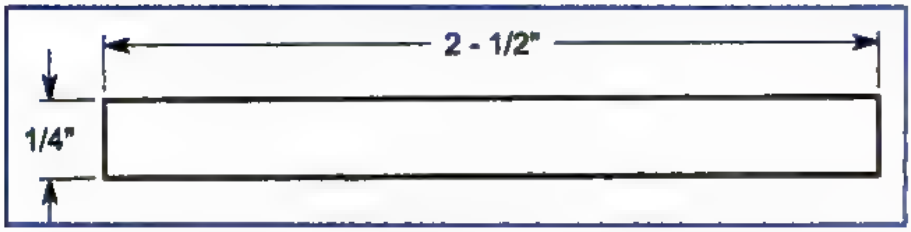


Figure 1 – Fingers for the SMD test tweezers are made from two pieces of single sided glass PC-board material

Passive surface-mount devices (SMDs) are frequently unmarked and can be difficult to test. If you use test probes and a multimeter, they may flip or spin out of the probe tips when you apply pressure, which can be very frustrating.

To solve this problem, build the SMD tweezers described below. They grip the SMD resistors and capacitors squarely, allowing for quick and easy measurements. When used with an auto-ranging multimeter, the value of components can also be double-checked before mounting them on the circuit board when assembling a project.

The tweezers consists of three components. Cut out the parts as shown in Figures 1 and 2, two parts as per Figure 1 and one part as per Figure 2. Use a plastic abrasive pad to polish the copper side of the PC board until it is shiny. Glue the assembly together (Figure 3) with 'five-minute' epoxy, making sure the foil sides face inwards. After the epoxy has cured, squeeze the tweezers together and carefully sand the tips so they are flush with each other and square. Remove any sanding burrs from the ends with a small file. Next, carefully solder (don't overheat the epoxy) the test leads to the foil. Finish the tweezers with heat shrink tubing or electrical tape arranged to dress the wires out of the way. Keep the multimeter leads short to minimise stray capacitance.

To use the tweezers, simply connect them to an auto-ranging meter and grip the SMD. Very rapid measurements are possible using this simple tool.

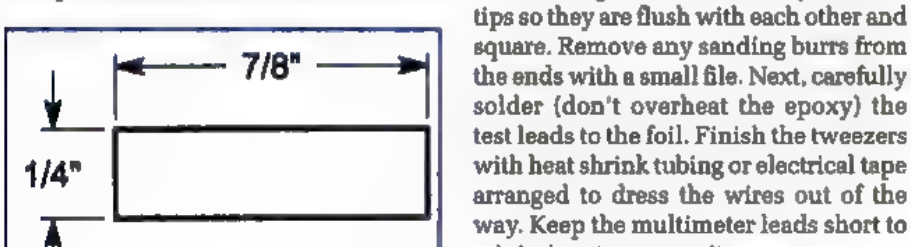


Figure 2 – The spacer block is made from any hardwood

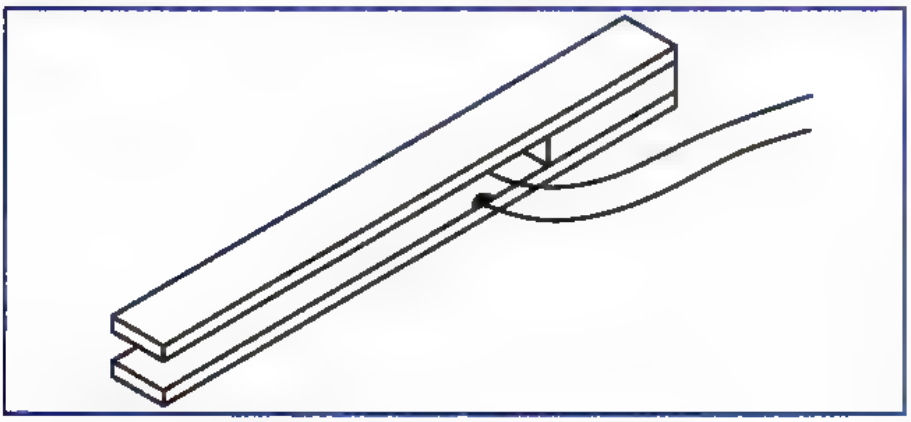


Figure 3 – Assembly of the SMD test tweezers

Lightning protection

Kev Peacock VK4VKD

During the recent months we have seen some horrific storms along the Eastern seaboard of Australia. While wind is a big problem for all radio enthusiasts, an even bigger problem can be the intensity of lightning strikes that come with these savage storms.

As most people already know, I am in the business of building towers and antennas. One of the most often-asked questions I am presented with is, "How do I prevent lightning from striking my tower?"

Well, the answer to that question is simple – you cannot prevent lightning from striking your tower!

Why?

Rather than create an atmosphere of fear I should qualify that statement – you cannot PREVENT lightning from striking – but you can reduce the damage sustained by your station when it does strike.

I have reproduced here an article by a US company called PolyPhaser – this article will explain more clearly why you cannot prevent a lightning strike and it will also show you how you can minimise the damage if it does happen.

One of the features of the towers that I invented and build is the ability to reduce the overall height of the installation by easily and safely lowering the whole antenna array to a position closer to ground. This leaves only the standing tower as the high point and as you will see from the PolyPhaser article, the tower should be properly and adequately grounded to dissipate the instantaneous surge that comes with a strike.

Enjoy the article – and hopefully it might be you who gives me a call and says, "Thanks mate, I grounded my tower after reading that article. We had a lightning strike and the station survived."

Thanks PolyPhaser, for permission to reprint this material.

Grounding overview

- reprinted from the PolyPhaser catalogue

The severity of a lightning strike is a statistically predictable event. An economically designed protection/grounding (P/G) system should take into account a typical-to-large strike. The P/G system should be maintained on a monthly, or at the very least, yearly basis. This should include testing protectors, measuring the ground system (resistance), pulling on ground rods and cleaning/inspecting connections for corrosion and tightness. It should also involve a re-evaluation of the overall system design each time new equipment is installed, moved or modified.

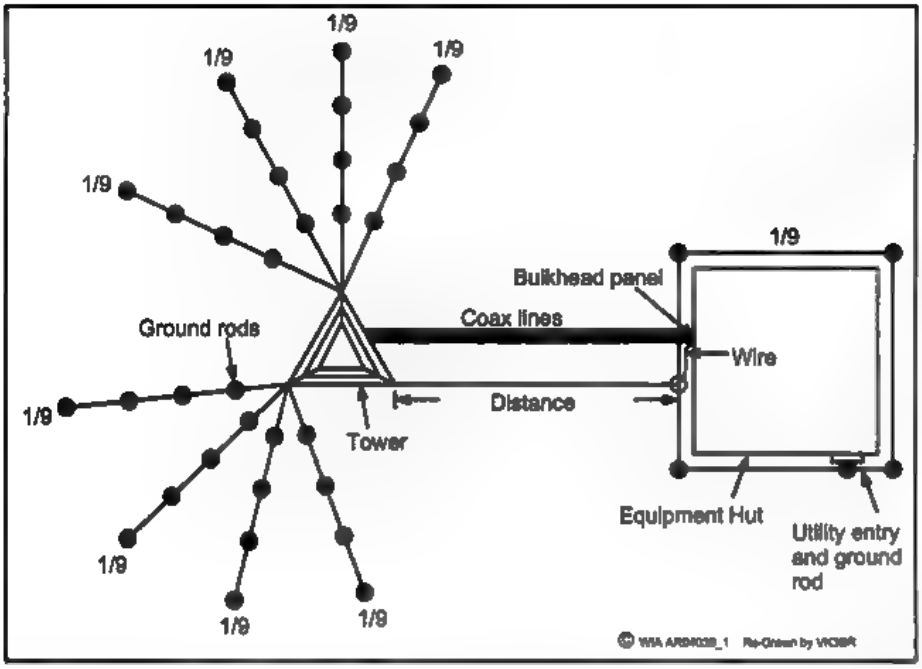
A lightning strike starts with a local electrical breakdown of the atmosphere (a step leader) and it steps about 46 m in 1 microsecond time increments every 50 microseconds. During each of the 49 microsecond dormant stages, an imaginary hemisphere of 46 m radius can be used to determine the next jumping distance. Any object which penetrates this hemisphere can be chosen as the point of attachment for the return stroke (lightning strike).

Since this is a hemisphere, the geometry of a horizontal strike to a tower can occur anywhere above the 46 m point over average terrain (side mounted antennas above this height are vulnerable). This has led to the 46 m radius "rolling ball" concept, where an imaginary ball of that radius is rolled along the ground in all directions. Each touch point of the ball, with any ground mounted object, is subject to an attachment point (hit). Coax grounding kits should be installed every 23 m above the 46 m point. Install additional kits below 46 m at the middle, bottom, and prior to the building entry bulkhead.

Lightning will take the path of least impedance, which is both resistive and inductive. The larger the conductive surface, the lower the inductance. Bends add inductance. Ground wires should be large and run straight for minimum inductance and voltage drop. They also should be separated from all other conductors by 15 cm to 20 cm and should not be run inside or through a conductor unless they are bonded to it. In conduit, ground wires should be bonded on both the entrance and the exit. When working with a metal wall, bond the ground wires to both sides. Do not go through the wall.

Your tower will be the point of impact like a pebble going into a still pond. The rings will be equi-potential waves as they diffuse into the surrounding soil. The ground wires in the soil still have inductance. This inductance, shunted by the soil resistance, sets up a time constant or velocity of propagation (since capacitance is present also). The "ripples" will propagate faster with larger surface area wire and better conductive soil. The doping of soil with MgSO4 (epsom salts) can help increase soil conductivity and help retain water.

It is not necessary to run interconnecting rings around a tower. Self-support (free standing) towers will equalize the surge current to each leg (the coax leg may have slightly more current). Guyed towers should not have rings, even if the rings are to act as a collector for the radials. If each radial is interconnected directly to the tower base or leg, the inductance would be less than having only one or two connections going to a ground ring. Rings further out would be connecting radial ground rods that will have the same potential at the same point in time, thus little current will flow as compared to taking the same material and effort and running another radial from the tower base. Guy anchors should be grounded with no dissimilar metals (see PolyPhaser's book "The 'Grounds' for Lightning and EMP Protection", Second Edition, Page 24). In poor soil conditions, radials can be used together with ground rods to ground the anchors. A ground system can be obtained in many ways, but the most economical is with radials and ground rods. Radials of



Typical commercial tower earthing system

less than 30 m will disperse the tower base or guy wire energy outward while the ground rods can help take it to lower, more conductive soil layers. If the surge is not leaked or launched into the soil in the radial section(s), the ground rods, if lower soil conductivity can't be found, will develop high "E" fields and can arc in the soil to spread the charge outward. (This arcing is less likely in soils with higher conductivity.)

Arcing can cause glassification around the rod starting at the tip and working upward. The hot plasma fuses the silica sand, which is present in the soil, into a glass, which is a good insulator, since water is boiled out in the process and ground moisture can no longer contact the ground rod surface through the glass. This is why, as a routine maintenance, a tug on the rod, which produces easy movement, is a possible indication of glassificatian.

The whole practice of lightning protection is to control the discharge path and not have it randomly disperse in any direction. In normally conductive soil, two rods should be spaced the sum of their lengths. One long, deep rod or well casing will not be as effective as an array of radials and ground rods. Even if the one deep rod measures a low resistance, the inductance is usually much greater in conductive upper layer soil conditions, and saturation can occur which can cause eddy currents and additional inductance.

Unlike the radials, ground rod diameter size will have little effect on impedance unless the rod is very long. It is not always imperative to reach the water table, since this may be too far for the rod to be effective. It may be easier to salt dope the rod or use a chemical ground rod that collects precipitation. In poor soil conditions, the spacing of ground rods should be closer. Poor ground conductivity will not shunt the radials' inductance, thus more ground rods will help by either reaching more conductive soil or arcing to relieve the voltage potential. If not quickly dispersed, the voltage will build up at the tower and attempt to go another, perhaps unwanted, path (most likely into your equipment room).

All radials should be run away from the equipment building. The more radials there are, the more the current is divided. A perimeter ground system (ring around the building) will help form an equipotential plane. If this ring is approximately equal (in length) to each radial and if eight radials are used, each will have 11.11% the total surge energy. This will leave only 11.11% of the strike energy to the equipment building perimeter ground. The perimeter should only have one interconnection to the tower base and should be just below the coax cable runs. For mountain tops, where no conductive soil exists and only radials can be used, wide copper strap, 38 mm to 76 mm wide, should be used to minimize inductance.

The re-bar in the concrete tower base should be used to augment the grounding system. Concrete is conductive because of retained moisture and alkalinity. Tower J bolts or anchor bolts embedded in a conductive concrete tower base will couple strike energy to the concrete. The surface area interface between bolt and concrete will conduct high current levels during a strike. If the ground system is not adequate, the current density could be high enough to cause arcing at the bolt/concrete interface. When the re-bar is interconnected with the bolts, there is additional surface area interface with the concrete, reducing current density. With more surface area and less current density, arcing in the concrete is less likely to occur. If the ground system is not adequate, the current density will be high enough to cause arcing at the bolts. By interconnecting the re-bar, the current density will be reduced and arcing will be less likely to occur. To learn more on designing with the rebar, consult the book, "The 'Grounds' for Lightning & EMP Protection", Second Edition.

It is not necessary to route a single copper ground wire up a large galvanized steel tower. The difference in resistance between copper and galvanised steel is lost when compared to the inductive voltage drop due to surface area (skin effect). Placing a lightning rod at the tower top and using the copper cable and tying it to ground is ineffective. The inductive voltage drop of the wire (>100 kV) will cause it to jump (arc) to the tower, unless it is at least 60 cm from the tower. In fact, the use of bare copper cable can cause a corrosion problem to the tower and should not be used unless covered. Copper should never come in contact with galvanized steel. Tinned copper wire should not be used in the ground together with copper ground rods since the tinning will be leached into the soil very quickly.

Increasing the distance between the tower and the coax cable entry provides additional propagational time for the tower ground to absorb the strike energy. At the building entry bulkhead panel, coax protectors should be used in addition to another set of coax grounding kits. This bulkhead panel should have ground connectors connecting it to the perimeter ground with the same circumferences as the combined circumferences of the coax cables. Tower lightning protectors should also be included and grounded at this same point.

In a P/G system design, one should also think of system noise reduction and EMI/RFI (Tempest) shielding. This can be accomplished with a single-point grounding system. Sometimes the use at a single ground bus (called the Principal Ground Window or PGW) can act as your single point. All your equipment chassis should be grounded to this bus. It should be a large surface area connection to the ground system such as a PolyPhaser Bulkhead Panel, PEEP or PER. Typically, the plasma column of the lightning strike (return stroke) can have a voltage rise time of 20 - 50 nanoseconds. If it hits a tower, the tower will handle the majority of the current pulse to ground. The tower will also radiate the HF energy of the strike. The near field (high magnetic or H field) will penetrate equipment interconnection wires and induce surge energy. A Faraday cage can reduce this energy. A halo ground system with multiple down-conductors to the outside perimeter ground loop can act as a quasi-Faraday cage and give some low frequency shielding. Properly bonded metal building panels can act as a more effective cage. Double-walled screen rooms offer the greatest isolation.

Tower flasher lines, both strobe and conventional, should have protectors to prevent surge entry into the building and the power lines, as well as nuisance damage to strobe PC boards.

To ensure survival of the building equipment, all inputs/outputs (I/Os) must have protection and they should all be ideally located at the principal ground window or bulkhead panel. If these I/Os (power, telco, etc.) enter elsewhere, protect them first at the entry point (ground protector to perimeter) next run to Perimeter Ground Window (PGW) then protect it again before distribution by the cable trays. (Note: All trays should be grounded to the PGW or bulkhead panel.)

Technical Editor's Note

Further information on this topic, covering Australian 'best practice', can be found in the Standards Australia publications listed below.

AS/NZS 1768:2003 *Lightning Protection*

AS 4262.1:1995 *Telecommunication Overvoltages – Protection of Persons*

AS 4262.2:1999 *Telecommunication Overvoltages – Protection of Equipment*

2006 Callbook: *we need help!*

We have already started on the production of the next issue of the Callbook.

If you have any amendments which need to be made to the non-callsign information published in the 2005 issue, please let me have it ASAP.

For changes to the actual callsign information, make sure that any changes of detail reach the ACA before 30th June.

Also, we would be happy to receive photographs which may be suitable for the front cover.

E-mail to
callbook@wia.org.au
or by post to
Callbook PO Box 2175
Caulfield Junction 3161

Brenda VK3KT

Calling CQ CQ, this is VK5ZKT calling CQ and listening.....!

This is what may be heard if you happen to be tuning across the bands. Hello from VK5ZKT.

Karsten (Kas) Thole VK5ZKT
Email: karsten_thole@hotmail.com

I would like to take this opportunity to introduce myself and my radio shack to all amateur radio operators and shortwave listeners.

At the age of 13 I was becoming very interested in 27 MHz CB radio and 477 MHz UHF CB and the idea of playing around with radios. I saw a demo on amateur radio at the Perth Concert Hall on a school excursion and saw my first shortwave radio. I was AMAZED!!

I became more aware of electronics. The term "Amateur Radio" was new to me, and browsing through a copy of the 1995 Dick Smith Catalogue, I came across "amateur radio". I asked my Dad and he told me about it and how one could talk all around the world, and I was HOOKED!

I built a few electronics kits from Dick Smith and listened-in to shortwave stations on my first shortwave radio, a Toshiba. Then, a while later, I purchased a Sangean ATS 909, threw a wire antenna out the window and my shortwave listening began. The first stations I picked up included BBC London and VOA Voice of America. I was so amazed that this tiny radio, could "hear" these far away stations. I also listened into the amateur bands at night and heard many strange things, like 73, CQ, and HI. "What does this mean?" I have a chuckle when I think back to it all. I know exactly what it means now!

The family moved to Adelaide in 1998 and radios went to the wayside as I was settling into a new city. After a while I came across the North East Radio Club in Modbury and the bug bit once again.

I was finally licensed in 2001 with the call VK5HKT. Then I set to work putting up my first dual band antenna, the X-50 from Diamond Antennas, and borrowed a 2 m radio from Peter, the then President of NERC, formally VK5ZFW who was also my first contact on the 2 m FM band.

In 2003 I was granted an exemption from the full call theory once I graduated with the Certificate III in Electronic Engineering (Radio Frequency Communications). Once ACA approval took effect, I was granted the call VK5ZKT.

My current station consists of a FT-1000MP Mark V 200 W Transceiver, a fully restored Heathkit SB-101, restored by Keith VK5OQ who gave valuable time and effort in getting it working, thanks Keith. I also have a FT-817 5 W all mode all band backpack radio, an ICOM IC-207H which was a gift from my grandmother and 2 Philips FM-900 series FM-92s, one for 2 m FM and the other for 70 cm FM.

As far as antennas are concerned, I have a Hustler 5BTV 5 band trap vertical antenna for the 80, 40, 20, 15 and 10 m bands. The vertical trap antenna is in an elevated mount on the garage shed and the feed point is a further 4 inches higher, and I have a pair of ¼ wavelength radials made from 12 AWG wire for each of the bands. This antenna has given me superb DX results and local and interstate contacts. For receiving however, I use a ¼ wave (approx.) End Fed Zepp Long Wire antenna which is peaked on receive using an MFJ 969 Deluxe Versa Tuner II, as verticals tend to be a bit noisy on receive, due to the fact that the vertical is a omni-directional antenna, and the signal coming in cannot be focused as with a beam. That's why I use the horizontal antenna, for its superb noise reduction and directivity.

I fully encourage city and apartment dweller hams that live in deeds or council restricted areas, to try a vertical antenna. Even if you aren't fortunate enough to own a multi-band vertical, load up a ¼ wave section of piping, put down some radials (1/4 wave at the frequency of operation) and try it out. Refer to the *ARRL Antenna Book* or seek expert help before attempting any antenna project that uses RF currents. SAFETY FIRST!

So far from the 21/9/04 I have made 700 contacts with the vertical antenna using 100 W and less. My first DX contact was on 40 m to JQ2IQW in Japan using 20 W. I have worked the following DX-Russia, Japan, Ukraine, Britain, Ireland, Kuwait, Oman, Pakistan, India, Poland, France, Germany, China, Vietnam, and all of VKs, Island of Oland in the Baltic Sea, Papua New Guinea, New Zealand, Lord Howe Island, Korea, Japan, Italy, Norway, Saudi Arabia, Switzerland, Spain, Dominican Republic, South Africa, The Netherlands, Canary Islands, Denmark, Nashville TN in the US, New Hampshire US, Orkney Islands off the North Coast of Scotland in the North Sea, SW Islands of Singapore, Czech Republic and more.

So as you can see, great results with no big dipoles or fancy stacked arrays with 400 W or a linear amplifier, just a simple trap vertical running 100 W and less with ¼ wave radials in a suburban backyard. Believe me, it truly does work!

Best of luck with antennas and your DX endeavours. I hope to hear you all on the bands soon. Write or email me at the address shown if you have any questions, or would like further information. I can be looked up on www.qrz.com.

Best of 73 and good DX.

News from...

VK2 news

Compiled by Tim Mills

The Annual General Meeting of the NSW Division Company, as previously advised, will be held on Saturday 16th April 2005.

When nominations closed on 5th March, twelve nominations had been received for the nine positions. Also received were many agenda items. Ballot papers and the annual reports were posted out prior to Easter.

The Wireless Institute name has been associated with New South Wales since day one, now ninety five years ago. A meeting of concerned 'Experimenters' held at the Hotel Australia in Sydney, was reported during March 1910 in the 'Daily Telegraph' under the headline - A Wireless Enthusiasts Institute -. These 'Experimenters' were upset that the authorities were charging Three Guineas per annum for a license. That was a considerable sum of money in those days. In the 1915 - Year Book of Wireless Telegraphy and Telephony - there was a 'Wireless Societies' listing of - Wireless Institute of New South Wales - with Malcolm Perry as Secretary. There was a contact address of Box 2 at the King Street Post Office, Sydney, N S W.

It was 50 years last month since the Maitland floods, where many Amateurs were involved in providing valuable communications. The authorities recognized their contribution, when the NSW President Jim Corbin VK2YC, became the holder of an M B E award on their behalf. It is also 50 years since work started on acquiring and developing the VK2WI site at Dural. Round the same time, today's WICEN was formed. It started by being known as - CDEN - Civil Defence Emergency Network. It appeared that CD was too military in concept, so it was soon changed to WICEN.

The next exam based at Parramatta is scheduled to be held on Sunday 15th May. For details and application, contact the Parramatta office by telephone 9689 2417;

Fax 9633 1525; Mail to P. O. Box 9432, Harris Park, NSW 2150; or call in to the office at 109 Wigram Street on Tuesday, Thursday or Friday.

The Oxley Region ARC at Port Macquarie will hold their 30th annual Field Day on the long weekend - June 11th and 12th - at the Sea Scout hall in Buller Street. Field Day Coordinator is Bill VK2ZCW - Ph. 02 6581 0547 or the club email vk2bor@tsn.cc.

The recent work at VK2WI has enabled restoring the 2 metre morse training signal on 145.650 MHz. The 80 metre companion morse transmission on 3699 kHz is operating with a relocated antenna. The 80 metre signal is also used as a band indication. The 23 cm beacon has about 1 watt feeding the slot antenna, which was raised during the overhaul. Reports received indicate improved coverage. It was also possible to restore the 70 cm beacon after a temporary repair. The beacons for 6 and 2 metres remain out of service. They have to be replaced by a modern design. When this occurs, these and those on 70 and 23 cm will key in the CW mode, in place of the former FSK mode. This move will allow improved frequency stability and fit into the narrower allocations of the current band plan.

73 - Tim VK2ZTM.

Summerland Amateur Radio Club

Club information

Summerland Amateur Radio Club. VK2SRC
Ph.: +61 02-66247247

Club: 412 Richmond Hill Rd, Goonellabah, NSW. 2480
Email : vk2src@sarc.org.au
Echolink: 174957 VK2RSC-R
Post: PO Box 524, LISMORE, NSW., 2480, Australia.
Packet: VK2SRC-1@VK2YDN.#NE.NSW.AUST.OC
IRLP Node 6220.
Page: http://www.nor.com.au/community/sarc
Location: Grid QG61QE 28.80 deg South, 153.57 deg East
Classifieds, free adverts: http://www.lom.com.au/Ham/classifieds/
Pics on - http://sarc.org.au/photo/

73, John Alcorn, VK2JWA, SARC14 - Treasurer, SARC.
Reply to - vk2jwa@sarc.org.au

The first Summerland ARC roadside sign on the Pacific Hwy, near Woodburn.

~WYONG~

~another very successful NSW Central Coast Field Day

The VK2 annual Central Coast Field Day was held on Sunday, February 20 and was as usual very well attended. Amateurs travelled from overseas and Interstate as well as every corner of New South Wales to enjoy the camaraderie of the day and spend up big on all the bargains on sale.

The National WIA set up a stand on the first floor in the coffee lounge area, most of the WIA directors were in attendance. It seemed from the hectic pace that most of those attending the field day dropped in for a chat, to ask questions, make suggestions or join up.

~Want To Know More?

http://www.wia.org.au/news/2005/20050220-01.php

News from

Geelong Radio and Electronics Society (GRES) 2004

Rod Green VK3AYQ

The programme for 2004 was quite diversified, incorporating both educational and entertaining meeting nights. Members were given talks on a number of interesting topics. These included the mechanical operation of video recorders by David VK3ZDR. A representative from the Australian bar coding organisation spoke about bar coding of goods. He outlined methods of stock control using radio frequency identification. Another interesting talk was about paging systems. This included descriptions of personal pagers and how they had evolved to the present day. Doug VK3BHG, who is an airline pilot with QANTAS, gave a most informative talk about 747 airliners. This talk included statistical facts about the aircraft. He also explained how pilots navigate using great circle routes.

A number of instruction nights were held. Members were tutored in the use of 2 computer programs. The first was the CAD program "EAGLE". This program allows the user to draw a circuit diagram, design a PC board layout and get a hard copy of the design. The second program enabled the user to program a "Picaxe" microcontroller chip. A follow up to the Eagle program was instruction in printed circuit board manufacture for the home constructor. Another interesting evening was a showing of a videotape obtained from the WIA library. This was an overview of one of the VK5 2 m repeaters.

There were 3 visits during the year. The first was to the Ballarat Amateur Radio Group (BARG). While there we were given a talk on the construction of traps for wire antennas. The evening concluded with a hot supper. A visit to the QANTAS maintenance hanger at Avalon airport was arranged by Doug VK3BHG. Here we were shown a 747-300 aircraft that was being upgraded to a 747-400. During this upgrade the complete interior of the aircraft was to be replaced. This replacement also included all the avionics equipment. The final visit for the year was conducted by Bill VK3WJC. Bill is the operations/maintenance supervisor for "Omya Southern". This company grinds calcium carbonate, which among its many uses is used as a filler in paper. The factory runs around the clock 7 days per week. However it is only staffed for 8 hours per day 5 days a week. This is a modern state of the art manufacturing plant. All equipment is monitored and controlled by computer. Monitoring of the factory can either be done from the onsite control room, or from a remote computer connected via a telephone line.

While visiting the BARG we were shown their latest club project. This was a "screwdriver" antenna that covered all HF bands from 160 m to 10 m. This antenna is used for portable or mobile operation. After seeing this antenna it was decided that we would also build our own antennas. We have 16 being built at present. The Ballarat group has been most helpful giving us the benefit of their experience. These antennas will be of use to our members who either go on camping trips or are members of WICEN.

In addition to the normal Thursday night meetings, the clubrooms are also open of a Wednesday morning. A small group of members meets to carry out work on the rooms. They also engage in other activities such as sorting out equipment to be put in our museum. Visitors to Geelong may like to visit this museum which is housed in the "Old Geelong Gaol". The gaol is open to the public on weekends and public holidays. It is located in Myers St. Geelong on the fringe of the CBD.

Club meetings are held every Thursday evening at 2000 hrs local time. The rooms are situated in High St. Belmont at the rear of the Belmont Community Youth Club. Visitors are always welcome.

BARCFEST 2005

The Brisbane Amateur Radio Club will be hosting its annual "Barcfest" on Saturday 7th May

This year there will be a new venue and a new starting time.

The venue is **Mt Gravatt Bowls Club**
1873 Logan Road
Upper Mt Gravatt.

Starting time is 10am

For further information and table bookings contact Les VK4ZLP

E mail **parkerlf@optusnet.com.au**

phone 07 3343 7247

mob 0413 377 045.

Hope to see you there on the day!

Adelaide Hills Amateur Radio Society

Christine Taylor VK5CTY

At the AGM in February this year we had some resignations from the committee and enough nominations to hold a ballot, which is a sign of a healthy club. There are a few changes to the committee, as a consequence.

Geoff VK5TY was re-elected as President and thanked the retiring members of the committee, in particular, Bryan VK5SV, the retiring Treasurer for his 18 years in that position.

The new Vice President is Jim VK5NB, the new Secretary is Leith VK5QH, the Treasurer is Hans VK5YX, and the committee members are John VK5EMI, Barry VK5ZBQ and Dale VK5DC.

Bryan's last duty as Treasurer had been to set the membership fees at $25 per year rebated to $20 if paid before April 30th.

Rob VK5RG then presented the members with a very clear explanation of the requirements for all radio amateurs to comply with the current Electromagnetic Radiation rules. He explained how to use the charts in the material available from the ACA on the matter of EMR, so that any amateur could ensure that their station and equipment did comply with the requirements.

It was a very informative and interesting talk. No general meeting was held due to the lateness of the hour.

All visiting amateurs are invited to join the AHARS on the third Thursday of each month.

Fleurieu Group Luncheon

Christine Taylor VK5CTY

Graham VK5KGP again arranged a luncheon gathering of this group at Goolwa. 14 of us had a very pleasant lunch together then part of the group moved to the QTH of Garry VK5ZK, down on the riverfront for coffee and more talk.

The house was built by Garry's father long before the area became popular. It has a magnificent view across the lake with all its sailboats and the bridge across to Hindmarsh Island, so is a great place to enjoy with friends.

Th photo here shows Graham and Garry with some of Garry's aerials prominently in the view. Garry is active on many different bands and has knowledge of many different modes used by amateurs.

The diversity of the group that meets every three months reflects the interests of the permanent residents of the area because it includes people of many ages and interests. Some of the attendees speak to each other on regular skeds, others share interests in computers, packet radio or VHF. Some have worked and lived in the area and enjoy renewing friendships made then while some have childhood links with the Victor Harbour/Goolwa region.

It is an interesting group and there is never a lull in the conversations.

VK6 news

Will McGhie VK6UU
will2@iinet.net.au 08 9291 7165

Sea Rescue volunteers

The VK6 Advisory committee received the following request from the Volunteer Sea Rescue Group. Amateurs with some spare time may be interested.

My name is Roger Howell and I am the Commander of Whitfords Volunteer Sea Rescue Group (Inc.)

Our group is the largest volunteer based sea rescue group in Western Australia and we are in need of another radio home base station.

I write to you to ask if any of your members would be interested in joining our group and contribute to maintaining a radio watch with our existing three home bases.

We operate on both 27 MHz as well as VHF and HF. All equipment and full training is provided.

We operate from Ocean Reef marina and our existing base stations are located in Marmion, Beldon and Heathridge so we need someone close to the coast.

Our web site will give you some more details and can be found at www.whitfordssearescue.org.au

If you have any members interested I would be very pleased to discuss this matter in detail.

Regards
Roger Howell

More VK6 WIA History

Reading from the first W.A. Radio club minutes book, (later VK6 WIA) ended in 1921. Rather than rush the presentation this month's history is limited to 1921. Each year will be presented on succeeding months. It is difficult to gauge the interest in this history and whether VK6 notes should continue beyond the end of Book One, 1924. Getting local VK6 news is always difficult, so if you want more about VK6, you, the reader, have to do some writing from time to time.

The last meeting held at Perth Boys School was on 21st April 1921. There had been an offer of free meeting accommodation. A number of motions were passed, mostly local house keeping, such as the move of meeting venue. The location of the new venue was not mentioned. The next meeting was held at Stott's College followed by meetings at Warwick House. Agenda item 7 was "to advise Central Executive in regards to transmitting licences and to ask them what steps have been taken to procure same."

The first meeting at Warwick House on 20th June 1921 was addressed by the President, saying "all privileges enjoyed by amateurs at the present time were obtained through the Institute with hopes that the coming year would be marked by the beginning of better times for Radio enthusiasts."

The July meeting of 1921 had a lecture on a 3-valve amplifier. "Mr Middleton began a most interesting lecture on the construction of a 3-valve amplifier. The lecture was greatly handicapped by the lack of suitable apparatus with which to illustrate his lecture, but by means of very interesting diagrams was able to hold the attention of his audience." The minutes do not mention if the 3-valve amplifier was RF or audio.

Meetings were often a combination of Council and General meetings, with the short Council meeting before the General meeting. Also during this year a rulebook with useful information was to be drawn up and sold to members at a nominal cost.

Meeting attendance appears to have been a problem. Mid-monthly meetings were adopted in March, only to be questioned in July with a motion carried, "that if the mid-monthly meeting did not become a success within six months it should lapse." At the March meeting a motion was carried, "that each visitor be allowed to attend only one meeting per annum." One assumes that what was required at meetings was members rather than visitors.

At the September meeting two motions were carried: "that the Secretary be requested to write the Victorian branch re the deputation which was to approach the Prime Minister with regards to transmitting Licences", and, "that the mid-monthly meetings be discontinued." Discussed at this meeting was, "Were amateurs who used step-up transformers on spark coils without suitable choke coils causing oscillations to be transmitted over the mains?" The lecture was on "time", and agreed to be one of the most interesting delivered.

The 26 at the October meeting discussed transmitting licences for the Institute and a request to the Radio Department for licences. A question as to why radio frequency dead spots existed was put. The most probable reason suggested was geological formations. The lecture was on continuous wave transmissions.

The November meeting decided to cancel the December meeting with General meetings now to be held on the last Wednesday of each month, despite a previous motion to discontinue monthly meetings. It could just be my reading, or the minutes don't represent all of the discussion regarding holding meetings or not. However, reading ahead into 1922, meetings did continue on a monthly basis. The attendance at this meeting was 30, which is more than the numbers the VK6 WIA Division was averaging when meetings were discontinued a few years ago. To finish off the year, 1921, a lecture on electrical safety with, "a very interesting and spectacular demonstration of high frequency currents" was given.

So ends 1921, a time of spark transmitters and continuing attempts to obtain transmitting and receiving licenses. Anyone could build and operate a transmitter without any form of licence but radio enthusiasts wanted licences to regulate the growing interest.

I find the history fascinating. Instant communications did not exist except for the rare, expensive, limited telephone. It must have been an exciting time for anyone with an interest in radio communications. Any radio contact was new and almost everything was a first. And it was all home brew. Hope you enjoyed this step back into history with more next month.

VK7 news

Justin Giles-Clark, VK7TW
Email: vk7tw@wia.org.au Regional Web Site: www.reast.asn.au

Australian Optical Communications Record broken

On Saturday 19th February 2005 between 1100 and 1200 GMT, two way full duplex voice communication was established at 475 THz [630 nm] over a distance of 167.7 km [104 miles], between stations on the summits of Mount Wellington near Hobart in Southern Tasmania, and South Barrow near Launceston in Northern Tasmania.

The transmitters used were current modulated 1 W red Luxeon Lumileds with 200 mm diameter fresnel lenses and the receivers were BPW34 silicon diodes at the focus of a 250 x 200 mm fresnel lens and a FET input amplifier.

Signals going north were reported as 4/7 by Joe VK7JG, Jason VK7ZJA, Phil VK7JJ, David, VK6YA/7 and Chris Long on Mt Barrow. The signals received at Mt Wellington by Mike VK7MJ and Justin VK7TW on Mt Wellington were very noisy with readability to about 3/3 and two-way duplex voice contacts were completed.

This is certainly a record for Australian optical communications and possibly a world record for non-laser amateur communications. Congratulations to Mike and Chris this record has been a long time in the making. More info on the Regional website.

VK7 shines in the RD 2004

Congratulations to Martin, VK7GN for topping the VK7 HF Phone category with 373 and congrats to Richard, VK7ZBX who topped the VK7 VHF Phone category on 169. VK7 came second on the overall state ladder with a score of 1.077 and a HF QSO total of 1276 and a VHF QSO total of 1118 for 2004.

This means that our 2005 QSO benchmarks are HF 1507 and VHF 901. Thanks to all VK7 amateurs who participated and submitted logs. Lets make this year, the year we will take the old mugs off VK6!

BPL in VK7 – Aurora Energy's 2nd trial

The second trial is expected in May 2005. It will cover 1000 homes, and given the effort to install infrastructure if the trial proves successful it's unlikely to be taken out.

There is a substantial amount of fibre that has been and is being installed around Hobart and this will most likely provide the network feed points into the transmission system that will deliver the bandwidth to the last kilometre into homes.

REAST is looking to work with the National WIA BPL team to assist in whatever way is required with noise floor measurements, etc. A VK7 BPL Watch web page has now been established on the Regional website. Take a look and become informed!

North West Tasmania Amateur Radio Interest Group

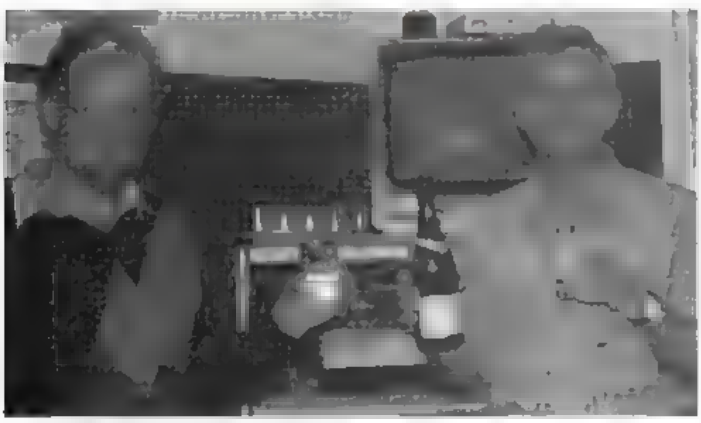
It's great news that radio amateurs in the North West of Tasmania have reformed as NWTARIG under the guidance of Tony, VK7AX. As reported a year ago in Amateur Radio magazine this group went into recess and has now emerging bigger and better!

Northern Tasmanian Amateur Radio Club

NTARC's March meeting was a very informative talk by Jason Reilly VK7ZJA, on the Optus Australia Cellular Phone Network with a focus on GSM and cellular technology. Thanks to Jason for a great talk.

Radio and Electronics Association of Southern Tasmania Inc.

Wednesday 2nd March saw about 20 people visit the Tasmanian Ambulance Service Headquarters thanks to Roger, VK7HRW. Roger is a Communications Operator with the service and he showed us the impressive system that they use to record and dispatch ambulances on a state-wide basis.



Chris and Mike Groth VK7MJ celebrating.

Roger VK7HRW at a control desk.

Technical abstracts

Peter Gibson VK3AZL

Improvements to the 2 metre copper loop

In Technical Abstracts in Amateur Radio for May 2004 we published a design for an all copper loop antenna for 2 metres. In Hints and Kinks in QST for October 2004, Dick Stroud, W9SR describes an improved feed for his previously published design.

The new feed eliminates forming the gamma match tube shape and deletes the shorting strap and its adjustment completely. The centre frequency can then be set by a simple adjustment of the end caps. If the VSWR is not very low after completion, the centre wire insulation is probably different from that on those antennas tested. If that is the case, change the wire length in 1/8 inch steps until the VSWR is minimum. All other design parameters remain the same. Figure 4 shows a drawing of the modified match.

The construction details are as follows.

Note 1 inch = 25.4 mm

1 Drill a ¼ inch hole on the centre-line of the elbow and tubing and 3/16 inch below the edge of the elbow. The gamma rod should then be spaced 9/16 inch from the OD of the lower antenna element, as shown. Place the ¼ inch gamma tube through the hole so that 4 15/16inch is exposed outside the elbow. The tube should not touch the back wall when inserted.

2 Solder the tube in place, with the gamma tube parallel with the lower element. Do not heat to the point that you loosen the elbow. Insert 6 inches of sleeving as far back as the element back wall. It should be exposed about 3/16 of an inch at the connector end of the tube.

3 Insert a 4 7/8 inch length of #16 vinyl covered wire and solder it to the coax connector centre pin. The length of this wire is critical and includes 1/8 inch excess, which is stripped for soldering to the connector. Both the rear of the connector and the exposed end of the gamma rod should be sealed against moisture.

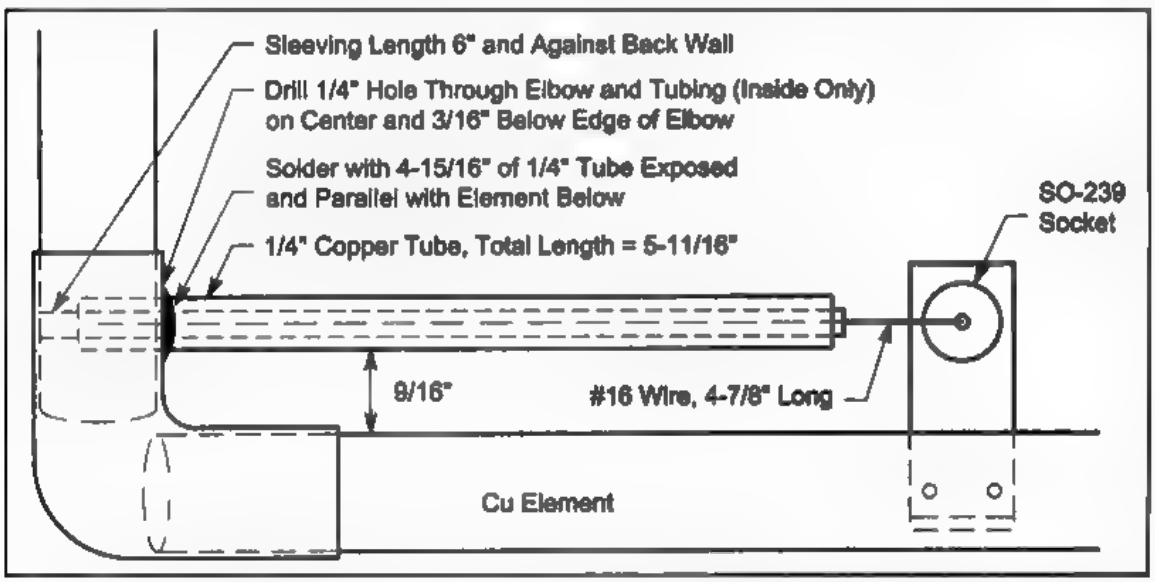


Figure 4. The modified gamma match assembly for the 2 meter copper loop antenna (AR May 2004) considerably simplifies the antenna assembly and adjustment by eliminating the gamma strap

News from VK7 *continued*

Roger demonstrated the computer aided dispatching system which allows the logging of locations of ambulances and units throughout the state, the system brings up 1:25,000 maps of the state for the operator to direct an ambulance crew, allocate priorities, actions and talk a caller through first aid/response techniques.

The radio communications network is shared with the Tasmanian Fire Service and is all low band VHF (78 MHz) equipment. There are mobile voting systems throughout the state providing coverage for most of the populated areas of the state. There is also heavy usage of a paging system similar to the Fire Service with most paramedics, ambulance officers and volunteers carrying text-based pagers. These pagers operate just above the amateur 2 m band.

A big thank you to Roger, Kaye and Toby for showing us around the control room.

Toby demonstrating the system to interested amateurs

Christine Taylor VK5CTY

Annual General Meeting

The AGM will be held on the first Monday in May. Please be there. We are proud of the fact that we usually have a very good number of people call in. Let us make this year's AGM another memorable one.

By the time you see this column you will have your Newsletter so you will know there who the nominees for each position are and you will know if it there will need to be a vote. If so, make sure you are there so your vote is counted.

See you on 80 metres on May 2nd.

ALARAMEET

Our ALARAMEET Coordinator, Marilyn VK3DMS is delighted with the number of people who have sent in their "expression of interest" forms and we hope you can all be in Mildura for September 9th to 12th.

As we are reminding everyone. ALARA will be 30 years old at the end of July so we will be celebrating 30 years of love and friendship when we meet in Mildura. As it happens it is also almost exactly 21 years to the day from the date of the first ALARAMEET, also held in Mildura, another excuse to celebrate.

We are still hoping we will hear from some of those early YL members with whom we have lost contact. So if you were involved in the original planning and organisation of ALARA please write to someone or ring or contact by email, just to let us know how you are and what you are doing now.

I can be contacted on 08-8293-5615, or by email at geencee@picknowl.com.au. Marilyn is on email at vk3dms@wia.org.au or via the ALARAMEET website http://www.alara.org.au

For any other inquiries to do with arrangements or attendance at the ALARAMEET please use the website, too. There is information there about the program and much more.

Publicity about the ALARAMEET

If you have a Caravan and Camping Show in your town or city and you visit it, have a special look in the tourist section. Recently, Sue Mahony, and her OM Steve VK5AIM did just that and spotted in a brochure about Mildura, that the ALARAMEET was included in the "Events for September". Well done, Marilyn to alert the Tourist Bureau to our gathering and thanks to them for bringing radio amateurs to the notice of the public.

Special event station in Melbourne

If you missed it this year, don't forget it next year. There is a Special Event Station each year for you to contact. It is VK3GP and is part of the Grand Prix held in Melbourne in March each year.

This year, as usual Gwen VK3DYL and her friends of the Foothills Radio Club were rostered on to operate this station. Did you contact it? If so, don't forget to send your QSL card in. I am sure the one you got back will be an interesting one for your collection.

Gwen was not the only YL at the Grand Prix. Jenny Z from VK5 was also there as part of the St John Brigade, making sure there was first aid available for the thousands of people enjoying the car racing.

Congratulations to Christine WB2YBA

Christine received the Alma Dea Romani Renaissance Woman Award late last year, in recognition of her many years of dedication to medicine.

Christine was one of the first DX members of ALARA and was President of YLRL for many years. We would like to add our congratulations to those Christine has already received for this award.

Another YL DXpedition

Elizabeth VE7YL and Gwen VL3DYL will operate from Vanuatu in May. They will be in Port Vila from 2nd to 8th May then on to Aore Island (both IOTA OC-035) from 9th to 19th May. They will then move to Tonga (via Auckland) and operate from Nuku'alofa (IOTA OC-049), from 20th to 24th May and from Vava'u (IOTA OC-064) from 31st May to 8th June.

QSL will be direct to Gwen VK3DYL at 3 Gould Court, Mt Waverley 3149 with SASE or via the VK3 Buro.

Please keep them busy on CW and phone and please send your QSL card to Gwen for confirmation.

The Luncheons

Unfortunately VK3 have decided they will suspend their luncheons till further notice, the changes of venue and the distances some of the YLs have to travel has made it all too difficult. We hope this is only a temporary hitch.

The luncheons in Perth and Adelaide are continuing as usual. Please contact one of the locals if you are in either of these cities at any time for more information. It is pleasant to make or renew friendships with "foreigners" and the luncheons are a good informal way to do this.

Christine Haycock receiving her award.

AMSAT

Bill Magnusson VK3JT

A welcome solution to the Keplerian Elements issue

At last it seems we have a solution to this vexing problem. The issue arose with a rather frightening announcement over a year ago. The "normal" methods of generating and distributing keplerian element data to amateur radio satellite operators would be discontinued. Now, this has the potential to create grave problems for all amateur space enthusiasts and indeed it has generated a huge amount of discussion on the BB. Various alternatives have been suggested and tried during the ensuing year. Some have offered a partial solution and others have been rejected for one reason or another. In the meantime some software writers are including routines in their latest versions to do the various manipulations automatically. Now it seems we are again in the debt of Dr Tom Kelso of "Celestrak" for a solution that will suit just about everyone. Early in March 2005, Dr Kelso released a free software package that completely automates the process. "TLERetriever" is easy to set up and will automatically download your specified keps from SpaceTrack. You will need an active SpaceTrack account. Having downloaded the zipped data "TLERetriever" will then, at the touch of a button, process the data to give you sets of "Celestrak" style elements for use in your tracking programs. The software is available from: http://www.celestrak.com/SpaceTrack/TLERetrieverHelp.asp

I have tried it out along with a number of my friends. It installs easily and works perfectly. The keplerian element sets it produces are checked for accuracy during processing and so far they have worked in the WiSP and InstantTrack programs that I use for satellite tracking and also in the visible satellites prediction program "SatSpy". The element sets seem to have the same validity as those which have previously been available from Celestrak. The program specifically addresses the thorny problem of differing satellite names. Indeed this is its most interesting feature. It looks like all the difficulties introduced by the changes in the structure of Space Command have been solved by this nice piece of software at the touch of a button. Thank you Dr Kelso!

The AMSAT group in Australia.

The National Co-ordinator of AMSAT-VK is Graham Ratcliff VK5AGR. No formal application is necessary for membership and no membership fees apply. Graham maintains an e-mail mailing list for breaking news and such things as software releases. Contact Graham if you wish to be placed on the mailing list.

AMSAT-Australia Echolink Net

The net meets formally on the second Sunday of each month. Anyone with an interest in Amateur Radio Satellites is welcome to join in and take part. Graham VK5AGR acts as net controller. The net starts at 0600 UTC and you can join in by connecting to the AMSAT conference server.

All communication regarding AMSAT-Australia matters can be addressed to:

AMSAT-VK,
9 Homer Rd,
Clarence Park, SA. 5034

Graham's e-mail address is:
vk5agr@amsat.org

While on the subject of forwarding Keplerian Elements.....

Efforts are being made to further clarify the long term situation regarding AMSAT's ability to continue to publish elements for amateur radio satellites on the web site and via the e-mail service. Contact is being maintained with Space Command concerning this possibility. The following information is from Ray Hoad, who provides the service for us and is copied from a recent ANS Bulletin. "I have been in e-mail contact with the new Air Force Space Command keplerian element web site concerning the transition from the old OIG web site. Air Force Space Command is currently considering how to administer the new web site. They have told me that no time line for a decision has been determined as yet. For the time being, I will wait their decision and I will keep you posted as I receive information. Patience is the keyword here."

AO-51 schedule page

Sorting out the operating schedule of AO-51 has always been a problem. The commissioning still continues and it may be some time before the schedule settles down completely. Due to the experimental nature of AO-51 it may never totally "settle down" at all. The group in charge of the AMSAT-NA web site have added a really nice new feature. It's called the AO-51 Schedule Page and is available from the home page. The data is presented in easy to understand graphical style and is kept up to date. Congratulations to the team. The regular AO-51 users will be very appreciative.

AMSAT volunteer report

As one of his duties, Gunther Meisse, W8GSM, AMSAT Treasurer and Board Member has been compiling a yearly account of the monetary value of AMSAT's team of volunteers. He recently announced that the 2004 total "in-kind services" significantly topped 2003 amounts. In 2004, AMSAT volunteers documented services to the organization totalling $364,947. Details of the Volunteer Reporting System (VRS) are available on the AMSAT-NA web site. If you have the specific skills required and the time available you may like to register by clicking on the link "Becoming a Volunteer". Perhaps you already do contribute. If so Gunther would like to hear from you so your efforts could be recognised along with all other AMSAT volunteers. AMSAT is a volunteer organization and it's good to see those who freely give so effort and so much of their time receiving the recognition they deserve.

OSCAR-11 reaches its majority!

OSCAR-11 achieved 21 years in orbit on 01 March 2005. It's still working and sending reliable telemetry on its VHF beacon. Congratulations to Professor Sir Martin Sweeting G3YJO and his team for this fine achievement. How much equipment in your radio shack is still operating after 21 years? Remember too that your gear sits on your operating bench or at most resides on a mast in your backyard. OSCAR-11 has been doing it all in the somewhat harsher climate of "space". In the latest of his regular "UO-11 reports", Clive G3CWV tells how during the period 15 February to 09 March 2005 reliable signals have been received from the 145.826 MHz. beacon, transmitting continuous ASCII telemetry from 25 February to 06 March. The beacon operates under control of the watchdog timer. Observations have indicated that the cycle is approximately 10.3 days ON followed by 10.4 days OFF. Assuming that this cycle continues, the beacon should switch ON again around 17 March. For a nostalgic look back into the past, why not track UO-11 and listen to the beacon - and remember it's been beeping away like that, keeping us informed of its condition for all of 21 years!

New "S" band downconverter features dual IF output frequencies.

I hope to be able to report more on this next month. A company called "Keps" has announced this device which it calls the 13LNC72-DB. I have yet to receive any reports of its performance in real life but the specs read well. Its main claim to fame is the availability of output frequencies in the 2 m and 70 cm bands. This feature alone would make it worth considering. It gives the operator a wider choice of equipment configurations in the shack.

ar

Plan ahead

2005 Wadda Cup Contest

24 September, 2005

SSETI Express update

March 2005

Graham Shirville G3VZV

SSETI Express is the first of a series of satellites being developed by the Education Office of ESA – The European Space Agency as part of the "Student Space Exploration & Technology Initiative"

The satellite is quite large – 600x600x700mm and will weigh in at more than 50kg.

It is being built by university students from a number of teams from all across Europe and being assembled at the ESA ESTEC facility in the Netherlands.

The satellite is set for launch on a Cosmos rocket later this year with a number of other satellites into a sun synchronous 98° 680km orbit from Plesetsk in Russia.

The payloads

There is an OBC, an attitude control system, a colour camera and cold gas thrusters on board as well as three cubesats which Express will "launch" soon after it separates from the launcher itself. All of these systems need to communicate with the ground both for tele-command uplink and for telemetry downlink purposes.

The Communications Suite

The main data transceiver is a UHF unit built by Holger Eckardt DF2FQ. It is based on his existing TF7 packet transceiver but the unit includes a 9k6 TNC and has its own switch mode power supply.

Originally this was going to be the only communications device being flown but there is also a set of experiment S band patch antennas being flown and they needed a transmitter to power them. To start with this was also going be a full data transceiver but the costs for a commercial unit made this option "non viable".

This gave AMSAT-UK the opportunity to offer a 3 watt S band transmitter free of charge to the project - on the basis that it could be linked to the UHF receiver for operation as a single channel FM voice transponder when all the experiments have been completed. The unit also incorporates its own switch mode power supply and a 38k4 TNC to allow the rapid downlinking of data – especially necessary for the camera experiment.

We were also fortunate that Jean Louis F6AGR from AMSAT-F was able to facilitate the frequency notification ITU process for the mission. Without his help I believe it would have been very difficult.

The S band transmitter progress

The transmitter unit is built into a beautifully machined and finished aluminium box provided by the University of Wroclaw who have also developed the three way power splitter and the experimental patch antennas.

Except for the TNC, which is a commercial TNC 7, the whole unit has been designed and built from scratch by the team. There are five boards. The exciter from Sam G4DDK, the PSU from David G0MRF, the command & control board and the sensor board from Jason G7OCD and the 3W PA from Charlie G3WDG (an identical unit to that flying in AO51)

The unit was first "delivered" to ESTEC early in November 2004 but further work on the wiring was needed and it was then returned to them again at the end of the month. At this stage the first actual amateur call was put through the satellite in the clean-room from the "control room" next door.

The unit then remained at ESTEC and was regularly exercised to download data via the temporary ground station that had been provided to them by Howard G6LVB.

During February it became clear that the data rate from the OBC to the TNC needed to be changed to accommodate other mission requirements. An AMSAT team went over to rewire and reconfigure the unit and success was quickly achieved.

We then went on to apply the conformal coating to all the PCBs (except around the RF parts). At this stage disaster struck as the somehow some of the coating found its way right inside one of the filter assemblies – result no RF output!

The unit was then brought back to the

UK for "repair" but quickly returned again during the first week of March by Sam and David.

They were able to demonstrate the unit working again and also helped the SSETI team solve a power limiting problem which caused the unit to be switched off for 150ms every time it was commanded on – not helpful when trying to transmit short packets.

Here is an extract from part of the SSETI Express Integration logbook for 2nd March 2005:

ESA_Neil, AMS_David and AMS_Sam power up the OBC, UHF and S-BAND for the purposes of testing.

- The initial power consumption of S-Band FM seems good
- The carrier is brought up successfully with the usual command
- The DTMF telemetry is turned on and received without issue
- The unit is switched to data config and data is transmitted without issue
- The carrier is brought back down
- The DTMF telemetry is turned on and received without issue
- The unit is switched to data config and data is transmitted without issue
- Transponding is tested without issue

MILESTONE 25: The S-Band sub-system is declared flight-ready.

Actually the S band transmitter is the FIRST sub-system to be declared flight-ready!

It has been a great experience for the AMSAT-UK team to be working with both the ESA experts and also the enthusiastic students – a number of whom have expressed the intention to get an amateur licence for themselves! It is a steep learning curve for them and for us - although we have been flattered in one presentation recently given by Neil Melville – the Project manager, which includes the text "Radio amateurs know what they are talking about"

What happens next?

A total of 150 solar cells, in ten strings of 15, are currently being laid onto the external panels of the satellite and we anticipate that these should be sufficient to enable the U/S transponder to work with the carrier up on a near 24/7 basis.

The flight model of the satellite will be completed over the next few weeks and will be subjected to the usual vibration tests and also thermal vacuum tests. Hopefully these tests will be completed without incident or problem.

The launch date is still not confirmed but should be late this summer.

The SSETI team will be providing full telemetry decoding information and will be encouraging us to provide downlinked telemetry data for them from around the world. They only have two ground stations of their own available and the software does not provide the "whole orbit data" that we are used to. Our worldwide network is certainly a unique facility and this data collection exercise will be good PR for the amateur satellite movement. ESA will be providing a prize for the amateur who provides them with the most. Full details will be available on the sseti website well before launch.

It is expected that the on board experiments should be completed within a matter of a couple of months from launch and after that the transponder can be placed into service. There is still a long way to go before that happy state becomes a reality and we have to remember that this is a high risk project – but if we don't try.....

References:

Full information about the project is available at the regularly updated www.sseti.net website. This includes the complete integration logbook mentioned above. It is a big file but makes very good reading for satellite enthusiasts!

The webcam: http://sseti.gte.tuwien.ac.at/WSW4/express4.htm

Downloads: http://sseti.gte.tuwien.ac.at/WSW4/express_downloads.htm

Space Colloquium

Members of the AMSAT-UK team who produced the S Band transmitter will be giving a presentation on SSETI Express at the AMSAT-UK Space Colloquium. This will be held at the University of Surrey in Guildford from 29 – 31st July. All Radio Amateurs and SWL's are welcome to attend the event. For further details contact the secretary Jim Heck G3WGM

Tel: +44 1258 453959
Email: g3wgm@amsat.org
Website: http://www.uk.amsat.org/

BT

See pictures inside back cover

WIA welcomes new members

February

Stanley R Aldridge VK4MFA
Christopher J Andrews VK4KAE
D Apted VK7DA
John G Badcock VK5ZAP
John Barnhill ZL2TCN
Dennis Bauer VK4MHQ
J Bazley VK4OQ
Raymond A Bell VK2BEL
Richard Benfatto VK2CRB
John D Britton VK2ZJB
Malcolm J Brotherton VK2HSV
Richard J Burden VK6TT
Jamie G C Campbell VK2YCJ
Ross Carter VK2SS
Ray Chalmers VK2VA
Lennart Christensen VK2BLZ
Carl N W Curwell ZS6BEX
Leonard C Daley VK2ZFD
Graeme M Dowse VK2CAG
James W Duggan VK7SM
Will Duncan VK2HWJ
Bryon Dunkley-smith VK3YFL
John Elliott VK3CVF
Mark W Forsyth VK3ZMF
Adam Gardiner VK2YAG
Richard Gibson VK4YA
Graeme Greenwood VK2ZIS
Robert P Gupry VK4ZL
Mark A L Hadfield L60443
Brett Hazell VK2CBH
J J Hehir L21224
Gordon J Heyes VK2PO
Colin Hinxman VK4ACH
Dennis E Hosken VK3ZLY
Greg Kelly L21225
Lloyd Kubis VK4ERQ
John Kuiters VK2ZJK
Peter Kutas VK2UPK
Ian Lloyd VK3IDL
Wayne Lonergan VK2HWL
Roy Longworth W9QM
Shane Magrath VK2KEP
Alan Meek VK4WR
Timothy Molyneux VK4OKH
Binu G Naikeraparambil VK2BNG
Alwyn M Nelson VK2DDZ
Jorgen Nordqvist L41087
David Oates VK5ADO
Thomas H G Oettle L21223
Craig Pattison VK2BTQ
Alan Peake VK2TWB
Steve Pettet VK2KSP
Gary Ryan VK2ZKT
James W Sanderson VK1BF
Cj Taylor VK2HEX
Dj Taylor VK2TDT
Stephen Teudt VK2TXQ
Steven R Tregear VK3TSR
Koen Van Den Beld VK2ZHA
Matthew Vaughan L50377
Michael M Wimborne J.p. VK3AUR

continued on page 49

Ian Godsil VK3JS

Contest Calendar April – June 2005

April	2/3	SP DX Contest	(CW/SSB)
	2/3	EA WW RTTY Contest	
	9/10	Japan Intl. DX Contest	(CW)
	16	Holyland DX Contest	(CW/SSB)
	16	TARA Skirmish Digital Prefix Contest	(PSK)
	23	Harry Angel Sprint	(CW/SSB)
	23/24	SP DX RTTY Contest	
	23/24	Helvetia Contest	(CW/SSB)
May	7/8	ARI Intl. DX Contest	(CW/SSB/RTTY)
	14/15	CQ-M Intl. DX Contest	(CW/SSB)
	21	VK/trans-Tasman 80m Phone Contest	
	21/22	Baltic Contest	(CW/SSB)
	21/22	King of Spain Contest	(CW)
	28/29	CQ WW WPX Contest	(CW)
June	4	VK/trans-Tasman 80m CW Contest	
	11	ANARTS WW RTTY Contest	(Digi)
	11	Portugal Day DX Contest	(SSB)
	11/12	South America CW Contest	
	11	Asia-Pacific Sprint Contest	(SSB)
	18/19	All Asian DX Contest	(CW)
	25/26	Marconi Memorial HF Contest	(CW)

Greetings to all contesters

Please find below details of two important VK contests. Both of these events are worth supporting for a variety of reasons. Please make a point of joining in this year. They are all on Saturday nights, so it should be possible to spare some time for your radio hobby.

Log Submissions can be a chore that many of us do not like; but they are part of the business of participating in a contest.

Today, most operators use logging programmes and they immediately take away the "chore" aspect, because there is built into the programme a self-scoring and submission sub-programme. This means, in fact, that if a contestant wants to, he can finish his contest and within 10 minutes have prepared and sent via email his log for that event. There are operators in VK and ZL who do just that! This way the whole event is over and the op. is free to prepare for the next occasion.

If this seems brutal, there is still no reason why a log cannot be prepared at a later date; BUT, the problem there is that the later date is often deferred, sometimes until well after the closing date stipulated in the rules. If that happens, the results are:

1. the contestant may well be omitted from the list for that year;
2. he will feel annoyed and neglected and not inclined to participate again;
3. the Contest Manager has to decide whether to include the entry or not, also at the risk of losing favour with those who did not send late entries.

It is only fair to ask that all who participate in a contest make every effort to have their entries in on, or preferably before, the closing date for that event. Contest Managers have lives to lead also, so they too rely on computerised calculations to get results out quickly.

Please be vigilant about this this year and don't let it stop you from enjoying the event!

73 and good contesting,

Ian Godsil VK3JS

Plan Ahead

Oxley Region Amateur Radio Club Inc.
Port Macquarie
30TH ANNIVERSARY FIELD DAYS
Queen's Birthday Weekend
11th & 12th June 2005

Rules 2005 VK/trans-Tasman Contests

Helpful Hint (particularly regarding "Scoring"):

These rules cover a variety of operator circumstances, so jot down or highlight only those parts that are applicable to you.

Contest dates

80 m Phone(Cat 1, 2 and 5)
Saturday 21st MAY

80 m CW(Cat 3 and 4)
Saturday 4th JUNE

160 m Phone(Cat 6, and 7)
Saturday 9th JULY

160 m CW(Cat 8)
Saturday 23rd JULY

Time

0800 UTC to 1400 UTC (in 6 one-hour stages).

Note: Best 5 hours to count (refer "Scoring").

Aims of contest

a). to provide a reasonably short event that doesn't impose too much on family life or sleep time, while giving 6 hours of constant on-air activity.

- to have a format suitable for both the serious and the novice Contestor, with a friendly and relaxing atmosphere.

b). to have a fair scoring system that:

- compensates for geographical location, usable band time and the difference in participation numbers between VKs and ZLs to provide, so far as is possible, a level playing field for all.
- places the main emphasis on VK/ZL contacts, by awarding bonus points for "trans-Tasman" contacts.
- provides incentive for the clever Operator, by awarding additional bonus points for working groups of "call-prefixes" in any hourly segment.

c). to promote/ give recognition to QRP operators and SWLs.

General

a). The Contest is open only to all VK and ZL call-signs.

b). The Contest shall be in 6 X 1 hour stages, and stations can only be reworked after the commencement of each hour.

However, stations worked during the 5 minutes before the hour cannot be reworked until 5 minutes after the hour.

c). Sequential numbers, commencing at 001, shall be given and received for all contacts made during the Contest.

(Use of RST numerals is NOT required).

Note:

Contest details: Rules, a suitable log sheet, and auto-scoring logging programs are available on the Contest web-site: http://home.iprimus.com.au/vktasman

Any queries or constructive criticism should be attached to the Log or emailed to: vktasman@hotmail.com

Bands:

80 metre band (May Phone/June CW)
160 metre band (July Phone/CW)

Frequencies:

80 m Phone: 3.535 to 3.625 MHz
80 m CW: 3.500 to 3.550 MHz
160 m Phone: 1.835 to 1.875 MHz
160 m CW: 1.810 to 1.840 MHz

Notes:

It is not in the spirit of the Contest to "park" on a frequency. While this will not be policed, 20 minutes is considered to be the maximum time between QSYs.

It is not in the spirit of the Contest to make contacts with another station at the same QTH, or in the immediate vicinity there-of.

Modes: LSB (DSB optional for QRP), CW.

Max. TX Power LSB: 100 watts pep. (QRP 5 watts pep, LSB or DSB) CW: 100 watts pz. (QRP 5 watts pz).

Categories:

Cat 1. Single Operator 80 m Phone
Cat 2. Single Operator 80 m QRP Phone (Also eligible to enter Cat 1)
Cat 3. Single Operator 80 m CW
Cat 4. Single Operator 80 m QRP/CW (Also eligible to enter Cat 3)
Cat 5. Shortwave Listener 80 m SWL
Cat 6. Single Operator 160 m Phone
Cat 7. Single Operator 160 m QRP Phone (Also eligible to enter Cat 6)
Cat 8. Single Operator 160 m CW
Note: no separate Category for 160 m QRP CW.

Multi- Operator

a). Club/Group stations shall be permitted to enter any Category, on the proviso that only ONE Operator is used during each 1-hour segment to perform ALL functions without assistance. (ie: TX/RX; log and time-keeping). - 2 to 6 Operators may be used.

b). Club/Group stations must score at least 100 points more than a Single-Operator station to have outright claim to any prize (including a VK/trans-Tasman Trophy).

If the leading margin is less than 100, Certificate(s) will be shared equally with the Single-Operator station, but the Trophy will be awarded to the Single-Operator station only.

Call-signs

a). VK4s north of the Tropic of Capricorn shall add "Central" after the suffix of their callsign for all contacts.

b). QRP/Phone stations shall add "Quebec" after the suffix of their callsigns for all contacts.

c). QRP/CW stations shall add "/Q" after the suffix of their call-signs, for all contacts.

Scoring

a). The final score shall be the sum of the five (5) highest scoring hourly segments, with the lowest scoring hourly segment not counted.

Note:

This gives the ZLs the option of working only 5 hours, if they choose not to stay up until 2am to try and improve their score.

It gives VK's (who have only 3 hours competition after 7pm), 5 hrs to complete a full Log, if they choose not to start until 5pm to avoid poor propagation at the start of the Contest.

b). VK shall be divided into 3 zones (for scoring purposes):

"East" VK1, VK2, VK3, VK4 (south of Tropic of Capricorn) VK7 and VK9

"Central" VK4 (north of Tropic of Capricorn); VK5 and VK8

"West" VK6 and VK0

c). VK to VK - except VK (East) to VK (West) = 3 pts

VK (East) to VK (West)= 3pts + 3 (distance)= 6 pts

VK (East) to ZL= 5 (distance) +1 (band time) + 5 (bonus)= 11 pts

VK (Central) to ZL = 7 (distance) + 2 (band time) + 5 (bonus)= 14 pts

VK (West) to ZL= 10 (distance) + 3 (band time) + 5 (bonus)= 18 pts

d). ZL to ZL = 3 pts

ZL to VK (East) = 5 (distance) + 5 (bonus) = 10 pts

ZL to VK (Central) = 7 (distance) + 5 (bonus) = 12 pts

ZL to VK (West)= 10 (distance) + 5 (bonus) = 15 pts

(ie: 5 bonus points awarded for each trans-Tasman contact)

e). During each 1 hour segment, additional bonus points shall be awarded as follows:

VK working 4 X VK call prefixes - each group = 20 bonus pts

VK (East) working 3 X ZL call prefixes - each group = 30 bonus pts

VK (Central)working 3 X ZL call prefixes - each group = 40 bonus pts

VK (West)working 2 X ZL call prefixes - each group = 35 bonus pts

ZL working 3 X ZL call prefixes - each group = 18 bonus pts

ZL working 3 X VK (East) call prefixes - each group= 30 bonus pts

ZL working 2 X VK call prefixes from

VK (Central and/or West) - each group = 30 bonus pts

Notes:

"Call Prefixes" are identified by the numeral in the call-sign prefix, (except when over-ridden by a "portable" or "mobile" addendum to the suffix, that indicates operation outside the "home" call area).

eg: VK3RX port5, and VK4TZ mob5, would both be regarded as VK5s.

"Groups" - each prefix numeral can be used only once in each "group".

- each call-sign can be used only once in a group per hourly segment.

Typical examples:

(VK2 + VK3 + VK7) = a "3 X VK (East) group".

(ZL1+ ZL3 + ZL4) = a "3 X ZL group"

(VK4/Central + VK6)

or (VK6 + VK8)

or (VK5 + VK6), etc.... = a "2 X VK (Central and/or West) group" (applies only to ZLs).

If more than one required "group" of call prefixes is worked in any hourly segment, bonus points are awarded for each "group".

(eg: VK/East working 3 X ZL call prefixes, twice in one hour = 2 X 30 = 60 pts).

VK working 4 X VK call prefixes four times in one hour = 4 X 20 = 80 pts).

Help? Download sample scored log sheet from Contest web-site, or use the auto-scoring computer Logger (ref Home-page menu).

f). Base station to QRP = 2 bonus points to each station.

QRP to Base Station = 2 bonus points to each station.

QRP to QRP Station = 4 bonus points to each station.

QRP using personally home-brewed RX & TX equipment (incl. kits)= 1 bonus point per contact.

g) SWLs:

To score, the callsigns and contact numbers of both stations in a QSO must be received and logged.

SWL stations shall score as for Amateur stations, except that scores shall be calculated for both stations in each QSO.

Notwithstanding that, as with Amateur stations, each call-sign shall be scored once only in each hourly segment. (This also applies when calculating scores for "call-prefix groups".)

Note:

"Participation Factor"- (to be applied by Contest Manager):

The number of participants on either side of the Tasman has a direct effect on the ability to score points from "across the Tasman", - a compensating factor shall therefore be applied in each mode Category, to all "trans-Tasman" contact points (not call prefix groups bonus points), scored by the Country with the lowest number of participants.

The factor is the "lowest number of participants" divided by the "highest number of participants" - ("participants" being the total number of stations compiled from all Logs received, in any one mode Category).

eg: 50 ZLs divided by 150 VKs = compensating factor 0.33.

- All ZLs "trans-Tasman" points X 0.33.

Logs

Note:

Log sheets can be downloaded from the Contest web-site.

Written Logs can posted, or may be scanned and emailed.

Computer logging systems (providing information as below) can be emailed.

a). A separate Log shall be submitted for each Category entered, except that QRP Logs may be used for other eligible Categories.

b). A new log sheet shall be used at the commencement of each hourly segment. Number each Log sheet (eg: 2 of 6).

c). For each contact, logs shall record call-sign of station worked; numbers given and received; UTC time (10 hrs behind EAST).

To the right, leave columns for "contact" points.

At the bottom, provide space to record hourly "contact" sub-total, bonus point sub-total, and "hourly" total (calculate scores after the Contest).

d). If six (6) hours are contested, the Log sheet for the lowest-scoring hourly segment shall still be submitted for cross-checking, but shall be indicated as "not included in final score" by writing "LOWEST SCORING HOUR" on top of the relevant page(s).

e). Logs, or log entries that are not clearly legible, in the opinion of the Contest Manager, or which are lacking the required information (including scoring and a Log

Summary), may be included in the Results, at the discretion of the Contest Manager, but will be ineligible for prizes.

Note:

Entrants are requested to take the time to submit a proper Log, rather than a "Check-log", which serves little or no purpose, and does not support the viability of the Contest.

Log Summary

a). Logs shall include a Log Summary, showing:

Name; Phone number (optional); Address; Category(s) entered;

Email address (if available); Total points score claimed.

b). VK4s in "Central" zone shall identify as such at the top of their Log Summary sheet by writing "Central" after their call-sign suffix.

c). QRP stations claiming points for "personally home-brewed" TX and RX equipment (incl. kits), shall indicate accordingly on their Log Summary, to qualify for "home-brew" bonus points.

d). Multi-operator entries shall identify as such after their call-sign in their Log Summary, eg: VK7DF (Multi).

It will be assumed that all entrants submitting a log will have contested in compliance with the Rules and in the "spirit of the Contest" (unless determined otherwise by the Contest Manager).

No written declaration is required.

Lodgement of Logs

a). Logs must be received either by post, to:

VK/ trans-Tasman Contest,
28 Crampton Crescent,
Rosanna, VIC. 3084
AUSTRALIA.

or by email to:

vktasman@hotmail.com

in either

"Word doc", "Excel", or scanned hand-written (if legible).

Use "text file/Notepad" only if above formats are not available.

b). Closing Dates for receipt of Logs shall be at 0700 UTC on

17th June, 2005 (80 m Phone/SWL)
1st July, 2005 (80 m CW)
5th August, 2005 (160 m Phone)
19th August, 2005 (160 m CW)

Note

Operators are requested to submit their logs even if you have a low score and don't think you will win. This will justify the effort and expense involved by the Contest Manager and ensure the on-going success of the Contest.

Awards:

VK/trans-Tasman 80M Trophy:

Highest Log score submitted in any one 80 m Category - (ref Multi-operator Rule)

Certificate 80 metres 1st Phone
Certificate 80 metres 2nd Phone
Certificate 80 metres 3rd Phone
Certificate 80 metres 1st QRP/Phone
Certificate 80 metres 1st CW
Certificate 80 metres 2nd CW
Certificate 80 metres 3rd CW
Certificate 80 metres 1st QRP/CW
Certificate 80 metres 1st VK
Certificate 80 metres 1st ZL
Certificate 80 metres 1st SWL
Certificate 80 metres (Night-owl's award) Top Phone score in 6th hour
Certificate 80 metres (Paddle-pumper's award) Top CW score in 6th hour
Certificate 80 metres (Wooden Spoon award) Lowest Log score submitted

VK/trans-Tasman 160 m Trophy:

Highest Log score submitted in any one 160 m Category - (ref Multi-operator Rule)

Certificate 160 metres 1st Phone
Certificate 160 metres 2nd Phone
Certificate 160 metres 3rd Phone
Certificate 160 metres 1st QRP / Phone
Certificate 160 metres 1st CW
Certificate 160 metres 2nd CW
Certificate 160 metres 3rd CW
Certificate 160 metres 1st VK or ZL (if not the Trophy winner)

Publication of Rules and Results

a). Rules will be published on the Contest web-site:

http://home.iprimus.com.au/vktasman.

There are links to this site on the:

www.wia.org.au WIA Federal web-site and most VK State web-sites
www.nzart.org.nz NZART web-site
www.vk4dx.net Contest web-site

Rules may be published in "AR" and "Break-in" magazines.

b). Results will be published on the Contest web-site

and links there-to, by the following dates:

80 m Phone and SWL - 22nd June 2005
80 m CW -- 6th July 2005
80 m overall results/prize-winners 6th July 2005
160 m Phone - 10th August 2005
160 m CW -- 24th August 2005
160 m overall results/prize-winners 24th August 2005

Results will also be published in "AR" and "Break-in" magazines.

Harry Angel Memorial Sprint

1000Z – 1146Z

Saturday 23 April, 2005

This an annual Contest to remember VK's oldest licensed operator, Harry Angel. Please note the time length of the Contest - 106 minutes, Harry's age when he died in 1998. It is open to all HF operators.

Object is to make as many contacts as possible on band 80 metres, using modes CW and SSB. Categories: Single Operator (CW, Phone, Mixed) and SWL. Frequencies: CW: 3500 - 3535 kHz, Phone: 3535 - 3700 kHz. Contacts in DX window not permitted. Exchange RS(T) and serial number starting at 001.

Score two points per CW QSO and one point per Phone QSO.

Stations may be worked once only per mode. Logs must show time UTC, callsign worked (both callsigns for SWLs), mode, RS(T), serial numbers sent and received fpr each QSO. Send summary sheet showing name and date of Contest, name and callsign of entrant, category entered, address, points claimed and a signed declaration that the rules and spirit of the Contest were observed. Send logs to Harry Angel Sprint, 363 Nepean Highway, Chelsea, 3196, by Friday, 13 May, 2005. Logs may be sent via email to: vk3js@vkham.com

ar

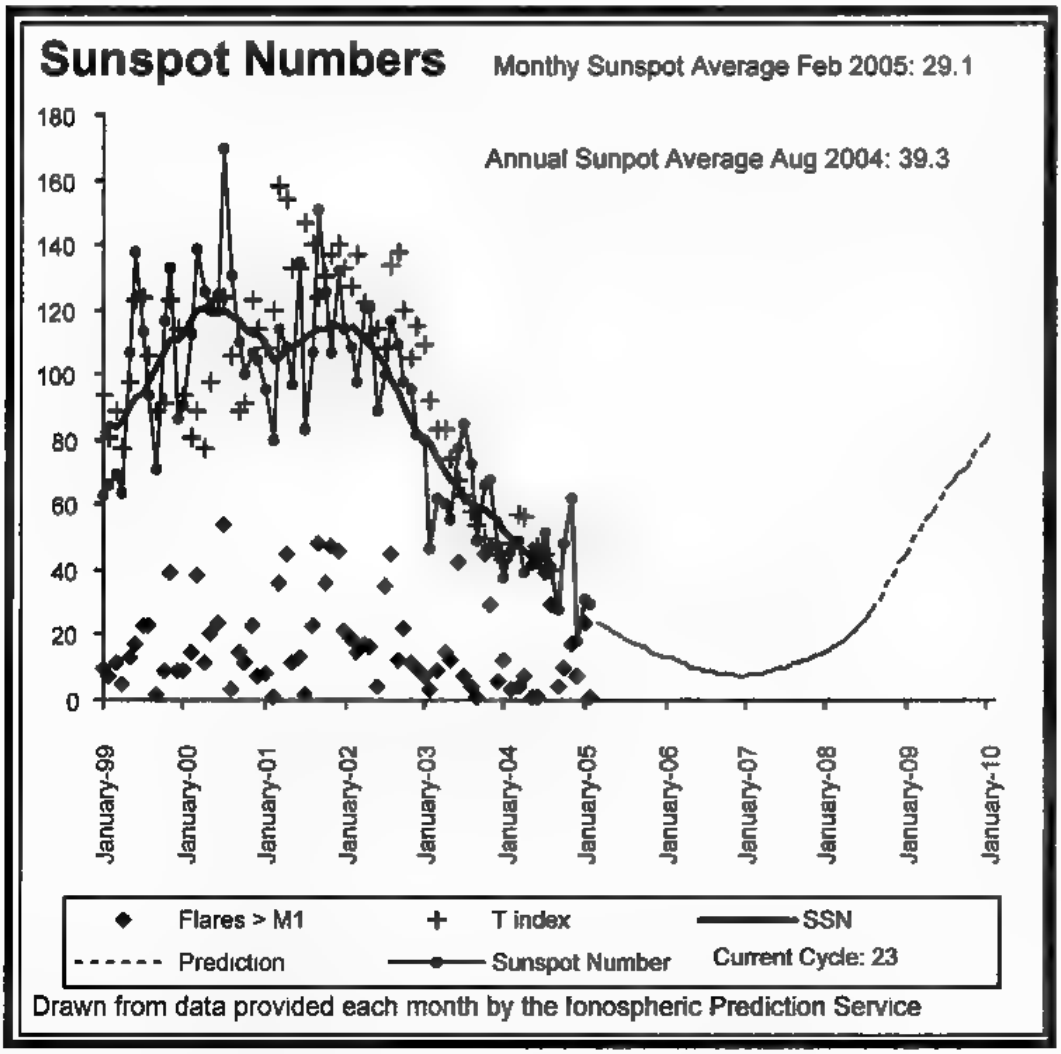
Robin Harwood VK7RH

Ups and downs

The seasonal propagational fluctuations are becoming more apparent with each passing day. I am noticing that the higher frequencies are dropping off as soon as it gets locally dark. Bands above 13 MHz are dead after 0800 although they can unexpectedly remain open until 1200. Winter is rapidly approaching and the shortwave allocations are starting to propagate in the daylight hours. I am increasingly noting that lower powered signals, usually masked by regular international broadcasters, are now being heard. This is due to a dramatic reduction of major broadcasters to Europe and the Americas. Audiences in Africa and Asia still will need shortwave, as there are fewer local placements available for domestic rebroadcasting of international stations.

DRM has been promoted as the saviour of shortwave broadcasting and true, there has been a sizeable increase in stations utilising this mode but there are insufficient numbers of commercially manufactured receivers in the marketplace. They are still expensive in comparison with the standard analogue receivers. Also DRM models have to be marketed differently because there is some confusion with some sets being called digital yet referring to frequency displays without having DRM/DAB capability. Receivers are available with this technology but are costly.

Have you also noticed a dramatic escalation of the so-called Numbers stations? These are clandestine stations exclusively broadcasting strings of four of five figure numbers in a variety of languages These are usually operated by intelligence agencies such as the Israeli Mossad, the CIA, MI6 etc. They have been around since prior to the Second World War and peaked during the so-called Cold War in the 80's. The spoken output is computer generated and almost impossible to crack. The Middle East still remains the major target of these unusual services. Their operational schedule naturally is extremely erratic, although the channels seem to be regular. I suggest you tune down on the lower frequencies because they are rarely above 12 MHz. However a well-known European agency has been operating close to 20 meters for many decades.



I have been experimenting lately with Echolink, which seems to consume less bandwidth compared to various instant messenger platforms. Once I got the firewall configured, I was able to communicate with a few hams yet still a little reticent about using it to operate via a foreign repeater. One does have to be very careful as there are some repeaters on bands not permitted to Australian hams e.g. 220 MHz. I currently reside in a retirement village that does not allow the erection of HF antennas, EL seems to be a temporary way out but does not have the romance of personally operating on HF.

Well that is all for this month. Please email me with your news and views to vk7rh@wia.org.au. 73 de VK7RH

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Beyond our shores

David A. Pilley VK2AYD
davpil@midcoast.com.au

South Africa

goes code free

South Africa has gone entry level code-free. This, with an announcement that as of February 4th passing a Morse exam is no longer a requirement for a full Zed-S licence.

According to a press release from the South African Radio League, a technical examination following the South African HARC Syllabus has become the basic requirement for entry to the hobby. Successful candidates are now given a call sign with a Zed-R prefix along with limited High Frequency privileges. Zed-R licence holders have full access to the 160, 80 and 40-metre bands and limited use of frequencies on 20, 15 and 10 metres. Also included is full access to all South African VHF and UHF ham radio spectrum.

To upgrade to a full Zed-S licence, the Zed-R licence holder has to achieve one of a number of electives. These include making at least 100 contacts on the air or by providing proof that he or she has spent at least 50 hours providing communications services for one or more public service events. Passing a Morse test is yet another option to an upgrade but South African radio regulators say that it's no longer mandatory.

The decision to go no code makes South Africa the latest nation to do away with mandatory Morse testing for access to the High Frequency bands. (SARL, ZS6AKV)

[ARNewsline]

Brazil

Radiosports: WRTC 2006

Brazil will be the host nation for the 2006 World Radiosport Team Championship games. Sponsoring groups are the Araucaria DX Group and the Liga de Amadores de Radio Emissão. Your scribe in company with Martin, VK7GN, represented Australia in this event in 1996. If you are interested in representing Australia in this World Olympic event you can obtain more information on-line at www.wrtc2006.com (WRTC). Be assured it is an event that will live in your memory forever and be proud to represent VK.

[WRTC]

60 metres expands world-wide

So far up to nine nations have given their radio amateurs access to the 60 m band, although some are imposing severe limitations on its use. The United Kingdom, Canada, Finland, the United States including its dependencies have opened up 5 MHz channels for use by radio amateurs. The UK and the US allocations include a common frequency of 5403.5 kHz.

The push for the band by the International Amateur Radio Union through its member societies is in recognition that the band fills a propagation gap between the 80m and 40m bands. Germany has permitted an amateur beacon callsign DRA5 to operate on a frequency of 5195 kHz to enable propagation testing using CW and a various digital modes.

In New Zealand the frequency 5680 kHz is available for emergency communications and training by the Amateur Radio Emergency Corps (AREC). Norway has also given access to two channels for internal emergency communications by radio amateurs. There has been a report of amateur stations in Portugal and Russia on 5398.5 kHz but no confirmation is available as to official approval for 60 m band operation in those countries.

[ARNewsline]

Ham honours

VU2RBI named Sandy Lynch Award winner

A ham from India has been named recipient of the 2nd Annual Lynch Memorial Award, given by the Tokyo International Amateur Radio Association. Bharati Prasad VU2RBI, received this honour in recognition of her DXpedition to Andaman Island and for her heroic work in the aftermath of the Indian Ocean tsunami.

VU2RBI has been a ham for more than two decades and is a founding member of the India's National Institute of Amateur Radio. She has provided ham radio communications at many events

Bharati Prasad VU2RBI

including the Asian Games and has helped local administrations with relief work after numerous disasters. She has also been instrumental in promoting several radio clubs across India.

(7J1AIL)

Africa

A job in Africa

The International Red Cross is in need of a communications expert to oversee their radio and computer installations in Africa and on several adjoining islands. A background in ham radio is welcome and could be an ideal opportunity for an adventurous radio amateur to activate some rare locations. For further information contact

ZS6P, whose e-mail address is zs6p@iafrica.com

(SARL)

India

Emergency comms meeting in April

India's National Institute of Amateur Radio is planning to hold an International seminar dealing with the role the hobby plays in Disaster Management and Information Technology. The date is April 16th and coincides with World Amateur Radio Day. One of the main topics to be covered is the lesson learned from the recent Tsunami disaster. More is on-line at www.niar.org

[GB2RS]

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VHF/UHF – an expanding world

David Smith VK3HZ – vk3hz@wia.org.au
Leigh Rainbird VK2KRR – vk2krr@telstra.com

Weak signal

David Smith - VK3HZ

This month has seen several periods of enhanced propagation over the southern region of the country. The openings covered a region stretching from Adelaide to East Gippsland and as far north as Canberra. Many contacts were had, and those of note are listed below.

On 16/2, Leigh VK2KRR reported strong signals from Adelaide with several S9+ contacts on 2 m. He also worked Richard VK5USB (S5) on 70 cm. Leigh also picked up traces of the VK6REP Esperance 2 m beacon on Spectran.

From 24/2 to 27/2, a slow moving high-pressure system produced an extended period of good conditions. Roger VK5NY, Brian VK5UBC, John VK5PO, Garry VK5ZK and Phil VK5AKK were busy working many stations from the Adelaide end.

Bill VK6AS has been worked from as far as Mt Gambier and, on several occasions, worked into Adelaide. On the morning 25/2, Leigh VK2KRR was hearing VK6REP at up to S3. Bill then appeared calling CQ on 144.1 MHz and Leigh worked him at S9 level – a distance of 2315 km. Soon afterwards, Ed VK3BG also managed to work Bill.

On the evening of 25/2, conditions were good to the north from southern Victoria. Peter VK3KAI reports working Ed VK3BG on 23 cm at good strength, with some QSB. Ralph VK3WRE and George VK3HV also managed to work Ed. The following night, Dave VH3HZ managed to work Leigh VK2KRR on 23 cm.

On 2/3, Brian VK5UBC, near Adelaide, reports excellent conditions, working, on 2 m, VK3AUU, VK3HZ, VK3II, VK2KRR, VK3RW, VK3ANP, VK3AXH, VK3LY, VK5OM/p and VK1ZQR (945 km). He also worked VK3HZ and VK2KRR on 70 cm.

On the evening of 2/3, Ross VK2DVZ reports working Nick ZL1IU on 2 m. The following morning, he worked Brian ZL1AVZ, also on 2 m.

On 3/3, Chris VK2DO worked VK5UBC, VK5PO, VK5AKK and VK5NY on 2 m. No luck on 70 cm.

Microwave

Colin VK5DK reports that on the morning of 14/3, conditions were very good for microwave operations. The VK3RXX 23 cm beacon in Melbourne was S9 in Mt Gambier. Colin headed off to a local hilltop about 40 km NW of Mt Gambier with equipment for 5, 10 and 24 GHz. At the Melbourne end, Alan VK3XPD went to his local site. Ralph VK3WRE also set up on Mt Tassie, near Traralgon in Gippsland with 5 and 10 GHz gear.

On arrival at Mt Edward, Colin set up on 10 GHz with a CW identifier running. He then received a phone call from Ralph to say that he was copying the signal quite well. Ralph and Colin exchanged 59 reports both ways on 10GHz, and then changed to 5.7GHz and exchanged 59 reports. Unfortunately, the site that Alan had chosen proved not to be good, as he was not able to hear signals on either band.

The distance of the contact is around 525 km, which is about 20 km short of a VK3 record. However, it was the best distance on both bands for Ralph & best on 5.7GHz for Colin.

On 10 GHz, Colin was running 1 watt and 12 watts on 5.7GHz. 600mm dishes are used on both bands. Ralph was running 500mW on 10GHz and 5 watts on 5.7GHz using offset feed dishes with horn feed.

EME

Doug VK3UM has released a new Windows version of his EME Planner and Autotrack, called EME2004. The older DOS-versions of these programs are widely used within the EME community, but are now becoming a little dated.

The new program has most of the features of the old, along with many additional features for Spatial and Real time Noise displays, an extensive database, as well as the prediction planning features. All planet and selected quiet and noise source tracking is provided so if you want to track Mars or Jupiter noise this will do it for you.

The program is available for download from the SM2CEW website at http://web.telia.com/~u92010241/index.html.

Doug also has a handy tip. If you have some unwanted critters gaining entry to your shack (like a 4' tiger snake) he suggests you use steel wool stuffed into the cable ducts (away from any possible moisture). It can be obtained in long rolls and is very easy to install and remove for cable modifications. Mice don't chew it either and hopefully it impedes the passage of long worms? Using the expanding foam stuff works fine but is expensive and you always need to add or remove a cable the day after it sets!

Doug said "I have done that now (to the EME shack) this season after the tangle with the snake. Sure gets the adrenalin going. Fortunately I spotted him as soon as I opened the EME shack door. If I had been sitting there at the time then leaving the shack with headphones on would have been quite a sight ... the mind and heart boggles!" Snakes are a common problem in the bush, and so far it's Douglas 6 ... Snakes 4.

Beacons

Ron VK3AFW reports that the VK3RTG beacon in Melbourne on 144.430 MHz is back on air, in test mode.

The beacon failed a few months ago and, upon further investigation, it was found that the crystal itself had died. Ron decided to do a post-mortem on the crystal and found that the drop of silver-loaded paint that provides the electrical connection with one of the electrodes that sandwich the wafer of crystal was missing, and appeared never to have been applied during manufacture, around 40 years ago. When Ron approached the manufacturer – Hy-Q Crystals – about the problem, they offered to repair it at no cost. How's that for an outstanding warranty!

So now the beacon is on test with occasional shut downs for various adjustments. For the next few weeks it will be radiating into a directional antenna with a NE heading. Ron asks for reports to him by email at vk3afw@optusnet.com.au.

The Dural committee has been busy refurbishing the VK2RSY beacons. The

23 cm beacon on 1296.420 MHz has had the feedline replaced which, by all reports, has greatly increased its level. The 70 cm beacon has also had some work and has been restored to normal level. 2 m is still off air, awaiting a total rebuild.

Rod VK2TWR reports that the VK2RSF beacon at Nimmitabel on 144.414 MHz is undergoing some much-needed refurbishment. It is currently under test from his QTH running 12 W to a pair of "big wheel" antennas and signing VK2TWR. The beacon may not go back to its old site, as there is some doubt about the availability of the site.

Glenn VK2JPR reports that the VK2RMS beacon at Bald Hill on 144.510 MHz is off-air indefinitely as the site has been closed by the National Parks people.

Please send any Weak Signal reports to David VK3HZ at vk3hz@wia.org.au.

Digital Modes

Rex Moncur – VK7MO

Joe Taylor K1JT has released a document on the technical aspects of JT65 which can be found at http://pulsar.princeton.edu/~joe/K1JT/JT65.pdf. Major topics include:

- Motivation and Design Philosophy
- Complete Technical Specifications
- Details of Present Implementation in WSJT
- Measured Sensitivity and Error Rate

The document indicates that Joe has found another 0.8 dB in the next version of JT65 (version 4.9.5, just released) that gives 50% correct decodes at -28.8 dB relative to the noise in a 2.5 kHz passband.

Dave VK2AWD reports that WSJT's new 'deep decoder' has made a major difference to the stations he can work via EME. Leigh VK2KRR and Gary VK5ZK have been experimenting with 2 meter JT65 QRP over a 754 km path and are getting copy of special messages down to 2 watts without enhanced conditions. Joe VK7JG, in Launceston, took QRP to the extreme and still received 50% copy from 0.25 milli-watts over the mountains from Rex VK7MO, in Hobart (168 km), without enhanced conditions.

Welcome to Gerry VK2APG who has joined the FSK441 activity sessions and has made his first contacts.

Some news from "Across the Pond". Bob ZL3TY has been fairly active on EME of late, using WSJT JT65b digital mode. His setup consists of a TS790A driving a homebrew 400W linear amplifier to an array of four 12 element K1FO yagis. On 14/12, he worked F6FHP at a (terrestrial) distance of 19,294 km, breaking the current world record by 7 km.

VK0MT Macquarie Island Activity

Dave VK0MT on Macquarie Island has recently become active on 2 m, running 100 watts to a single 10 element yagi. On 16/3, he succeeded in working Rex VK7MO on FSK441A Meteor Scatter. This is the first time that VK0 has been worked from VK7 on 2 m. Not much has yet been heard of Dave from VK3 as the distance (2150 km) is approaching the upper limit for MS.

On 17/3, Dave completed the first EME contacts from VK0, Macquarie Island, on 2 m on JT65 with W5UN and KB8RQ.

Unfortunately, Dave's time at Macquarie Island is coming to an end, as he is due to return to the mainland at the end of March.

Please send any Digital Modes reports to Rex VK7MO at rmoncur@bigpond.net.au.

2 m & 70 cm FM DX

Leigh Rainbird - VK2KRR

A slow start to February, but it ended up being a cracker in the south of the country after around the 20th of February.

Early on the 1st of Feb, Mike VK4MIK picked up a good path on 70 cm down south from the Atherton Tablelands into the Hodgson Range repeater 438.500. The distance of 639 km was a beauty on 70 cm and is now top spot in the ANVDG VK4 FM repeater records.

The 6th of Feb saw the first good opening in the south of Australia for quite a while. Probably the most interesting occurrence on FM during this opening was at 11.30 am my time. I was talking to John VK5PO on the Barossa Valley 146.825 repeater, we had just finished QSO and all of a sudden Chris VK3VSW calls in from Geelong and then straight after, Dion VK7YBI called in from near Burnie, Tasmania! Only got about one over from Chris before he dropped out as Chris has a big hill in that direction. Dion was OK coming in over 949 km to the repeater! VK5PO could hear Dion direct so they went to 146.550 to try the simplex contact, which I believe they made it through, this is 938 km.

On the evening of Monday the 7th of Feb, some very unusual tropo conditions were noted by some in the SE. A weather front and trough were passing across the SE. The leading edge of the front was around Melbourne and extended back to near Port Augusta. When looking on Internet weather charts, it appeared to be raining under cloud cover over a wide area covering Adelaide to Melbourne and around the coast. I initially dismissed this as being 'rain' and poor conditions.

That was, until VK5UBC and VK5ZLX started reporting some strong conditions on the VK Propagation Logger. Both Brian and Peter reported hearing the Geelong 2 m beacon, then, Brian was able to access the Echuca repeater 146.675. This got my attention and I thought I had better take a closer inspection.

It then appeared there was a strong surface based duct condition, partially before and mainly trailing the weather front. The indicated rainfall on the rain radar was actually radar enhancement caused by the strong conditions. It was very strong and wide spread across the land behind the front. Amazing!

Brian VK5UBC ended up being able to access the Shepparton 146.650 repeater noise free for quite a while. Brian was also able to access Charlton and other VK3 repeaters. At this time Peter VK5ZLX also commented on a second Ch10 TV signal interfering with his local TV reception!

The morning of the 16th Feb saw another good opening in the south. The main Adelaide Hills repeaters were worked here on 2 m but nothing from the 70 cm repeaters. Furthest repeaters

worked here were Port Augusta at 913 km, Port Pirie at 867 km and Central North at 833 km. VK5UBC was worked here on FM simplex and Brian also had a good copy on the Wagga repeater.

Some rare news from the west, courtesy of Phil VK6ADF at Katanning. Phil mentions, "during early February I managed to hear the Mt Barker repeater being used while I was driving around in Katanning. Something that is not a normal occurrence for me, and a contact via the Mt Barker repeater from home that normally I do not trigger." Phil also mentions, Sunday 13th Feb, VK6ET in Geraldton made contact to a Perth repeater for a short period, around 380 km.

The 21st Feb, Charles VK5XCP was aware of the conditions and went portable on a hill at Mt Gambier and worked the 486 km across to the Mt Baw Baw repeater and found George VK3HV, John VK3HJW and Jeff VK3VFL.

From around the 23rd to the 26th of Feb, conditions were absolutely HUGE. Mainly in the southeast, but there were also paths extending into VK6. There was so much going on during these few days that it all blends in and becomes a bit of a blur. This will probably be the strongest opening over the widest area in the SE for the whole year if last year was anything to go by.

I have nothing noted here that was particularly outstanding for FM. I was able to get to the usual repeaters in VK5 and VK3. The 70 cm band was not good to the west during this opening, though it was OK into VK3.

The morning of the 26th saw probably the strongest conditions of the period. Contact to the Mildura repeaters was excellent, full scale on both bands at 466 km. VK3FGN, VK3MTV, VK3NRJ and VK3KYF both at Mildura were worked simplex.

On the evening of the 27th Feb, Charles VK5XCP portable at Mount Gambier worked Dion VK7YBI from Burnie on 146.500 simplex. This was 570 km and Charles' furthest simplex contact. Charles was also going right over Melbourne and working to Yarra Valley and Mount Tassie repeaters.

Please remember to send through any 2 & 70 FM DX reports to Leigh VK2KRR at vk2krr@bigpond.com.

ar

WIA wecomes new members *continued*

January

Mark Apterman VK3VLY
Geoffrey F Atkinson VK3YFA
David Cooper VK4MIG
Ashley Geelan VK3HAG
Bruce S G Jarrett VK5CMI
Peter B King VK4BPK
Linda Luther VK7QP
Robert Mcdougall VK4CEN
Thomas Sawers VK4AOG
Paul Stevens VK4CPS
Dallas Taylor VK5WA
Pa Van Der Weegen VK2EX

December

James R Anderson VK4AQ
Grahame J Beechey VK2HGA
Brian J Belfrage VK4HBB
Serge Burjak VK4SB
David Byrne VK3DRB
Gordon Clarke VK2ZXD
Graeme A Collins L21222
Rm Dare VK3BRD
Craig Edwards L41086
Julian Grodzicky L10170
Ron Guyon VK2TGH
Gary C Matthews VK4HGM
Eric W Meyer VK4YUZ
Warren Payne VK2UWP
Gerard Rankin VK5ZQV
Kenneth Robertson VK3HKR
Stephen Thompson VK6HST
Charles Vella VK3TCV
Lyle R Whyatt VK5ZNB
Geoff Beadle VK3UDX
Richard Becker L70165
Ronald W Brumley VK4FC
Jacques Brunet VK5ZJB
Lance W Chandler ZL1LWC
Charles G Cottle VK2YA
David Coutts VK2BDA
Sj Daniels VK6HSX
Lee De Vries VK3PK
Shane M Delforce L21221
James Flannery-serle VK3KCU
Vernon French VK7HVF
Warren M Frost VK5HWF
Malcolm J Gardner VK5MJ
Derek K Griffin VK4KKG
Parry Gyngell VK3JPP
Richard Hanna VK2KRH
Paul Harms VK3DCV
Gavin Hart VK2ML
Greg Humphrey L50756
Douglas S Kaye L70164
James Lee VK4AJO
Bruce J Lees VK3FFF
George W Lobb VK2GWL
Warren Mansfield VK3HGU
Douglas Mcdonald VK4KET
Adrian Murace VK6XAM
Kenneth Robinson VK5HAL
George Simmans VK3HGS
Phil Smeaton VK2BAA
Graham C Thomas VK5HGT
Peter Turtiainen VK3TMX
John Watson VK2ZQX
Scott Watson VK4JSR
Stuart Williams VK4KKQ
Lindley J Williams VK7AJ

Pounding Brass in the jungle

Herman Willemsen VK2IXV

Although some types of keys may look the same, they all have their own individual features. However what makes them even more interesting is their history.

The above certainly applies to my newest addition, a Bolivian telegraph key of Siemens & Halske (S&H) design.

In 1847 Prussian Army Officer, Werner von Siemens and German mechanic Johann Georg Halske, founded the company Siemens & Halske.

Initially, S&H was based in Berlin with subsidiaries in Russia and Britain, but over the years the company spread worldwide and changed its name to Siemens.

S&H keys were manufactured between 1871 and 1930.

An unusual feature of S&H keys is their front and back contact arrangements. The lower contacts are actually stiff metal leaf springs or 3 cm long contact feet, which extend to the right and therefore cushion the impact of the top contacts.

The result is a smoother feel, possibly less wear and much softer key clicks, making the key almost soundless. That's why the Germans call this key "Die lautlose taste von S&H" or "the noiseless S&H key".

My Dutch S&H designed key looks neat and proper with lacquered brass, a gutta-percha knob and a varnished hardwood base. It features the lower contact feet and when you use the key, you can hardly hear the key clicks.

When I first saw the Bolivian S&H key it was in a shocking state, but after some careful cleaning, its fittings turned out to be brass, the knob gutta-percha and the rough wooden base showed only faint

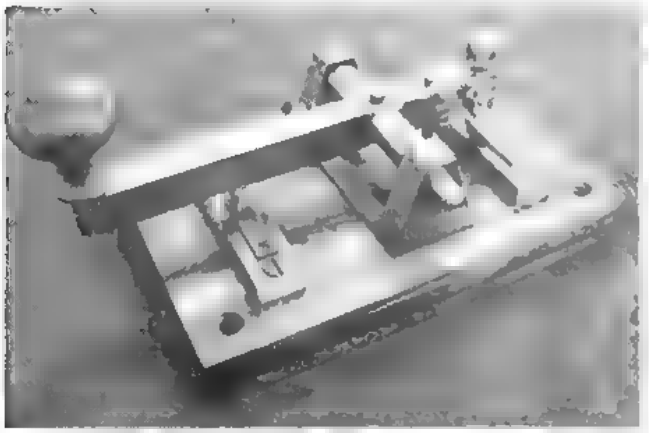

Photo 1 – The Dutch Siemens & Halske key.

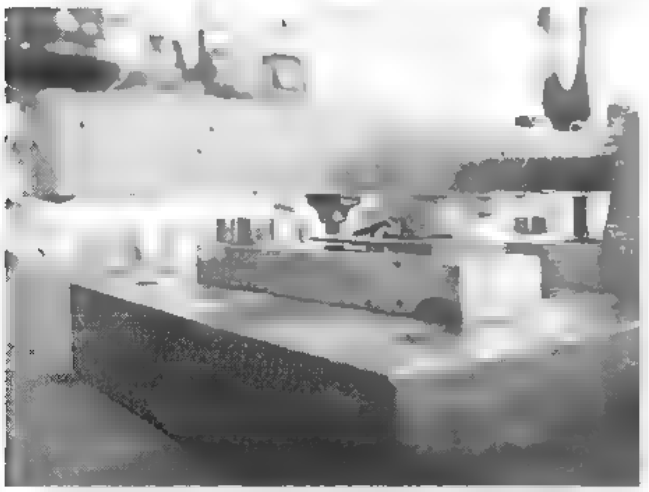

Photo 2 – Another view of the Dutch Siemens & Halske key showing the lower key contact.

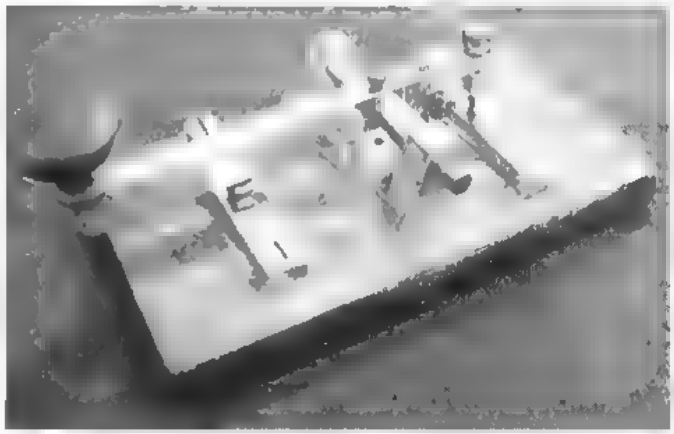

Photo 3 – The Bolivian Siemens & Halske key.

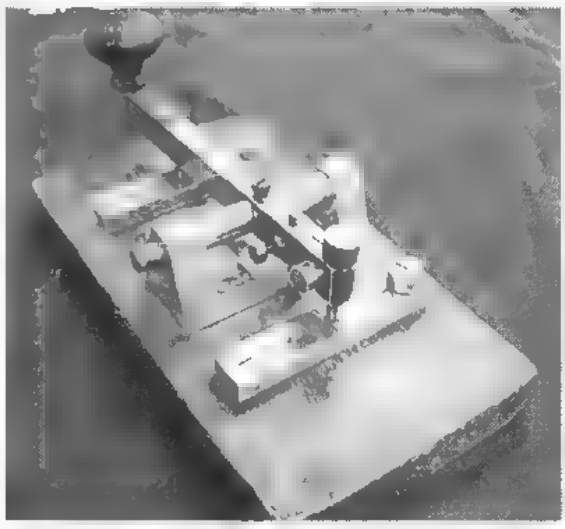

Photo 4 - Another view of the Bolivian Siemens & Halske key where one can see the two holes for the screws which held the 3 cm contact feet.

Over to you

The Institute WW2 Honour Roll is still incomplete

Given there were about 1800 licenced amateurs pre-war, the number of amateurs known to have been lost in action against the enemy is unrealistically low.

I had hoped to interest Veteran Affairs in an exercise which would scan the Wireless World 1938 listing of Australian Amateur radio licensees as a preliminary to a comparison with the National data base of WW2 casualties. Unfortunately the Minister elected not to help.

So by manually analysing documents pertaining to our AIF's involvement in operations against the Japanese in Malaya I have isolated 22 names of army signallers who might also have been radio amateurs. I have checked each of these names against the callsigns listed by the Wireless Weekly, without finding a match.

Signals personnel like Harry Grumber (a Radar officer in Singapore), "Gus" Kappe (Colonel, Div Sigs) and AIF. Signals Lieut. George Gill are highly likely to have had an amateur licence pre war. If any WW2 veteran can help with names of -other Amateurs known to have lost their lives in action against the enemy, I would appreciate a note, with the details, please.

But beware of the situation where a 2/29th- AIF Corporal Signaller named Stephen Brown had 16 amateurs with his surname, but all with different given-names.

By the way, it was Grumber who reported a radar sighting of the first Japanese aircraft on their way south to raid Singapore but was unable to have the air raid alarm sounded because the only officer with a key to the alarm switch was at the pictures.

C.G Harvey VK1AU
Hughes A.C.T

Where do you get it?

As an old timer coming back to some activity and am finding it difficult to locate radio parts both old and new. Mindful that we cannot all get to Wyong when we want to and also that what we are looking for may not be there, I would like to suggest that AR runs an occasional page titled "Where you can get it" or "Who stocks what". This could be put together for each state or major population centres, maybe one of the regular home brewers would volunteer their suppliers list. Regular advertisers in AR could be highlighted.

73 Phil VK2BTT
Lurnea NSW

The views expressed in the *Over to you* column are those of the authors, and do not necessarily reflect the official policy of the Wireless Institute of Australia.

Pounding Brass in the jungle *continued*

traces of paint.

It is obvious that at some stage the 3cm bottom contact feet were removed, as the holes for the screws that held them in place are still clearly visible. So now, when the top contacts meet the lower contacts, the key clicks are loud and clear. Perhaps the key's user preferred it that way.

The antique dealer, who sold the key to me, said that he found the key in 1981 in his hotel in the tiny North Bolivian jungle town of Rurrenabaque (Rurre), on the Beni River, the gateway to the great Amazonian plains.

He told me that conditions there were rather remote and primitive.

You could only fly in or out of Rurre by plane. An ancient generator supplied electricity between 8am and 8pm and dinner consisted of either warm rice with cold eggs or warm eggs with cold rice. Although he can't recall seeing any telephones, locals told him that before their installation, this spark key was used on the telegraph circuit between Rurre and La Paz, providing the only QSO between this remote rainforest settlement and the outside world.

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HF Predictions

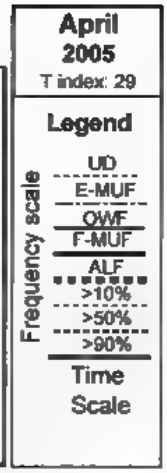
by Evan Jarman VK3ANI
34 Alandale Court Blackburn Vic 3130

These graphs show the predicted diurnal variation of key frequencies for the nominated circuits.
These frequencies as identified in the legend are:-

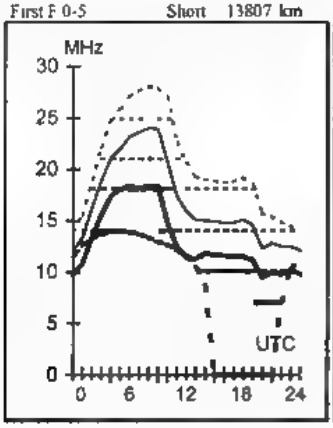
- Upper Decile (F-layer)
- F-layer Maximum Usable Frequency
- E-layer Maximum Usable Frequency
- Optimum Working Frequency (F-layer)
- Absorption Limiting Frequency (D region)

Shown hourly are the highest frequency amateur bands in ranges between these key frequencies, when usable. The path, propagation mode and Australian terminal bearing are also given for each circuit.
These predictions were made with the Ionospheric Prediction Service program: ASAPS Version 4

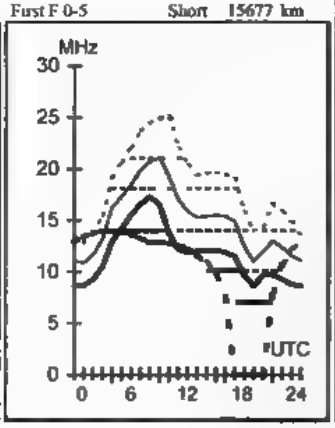
April 2005
T index: 29



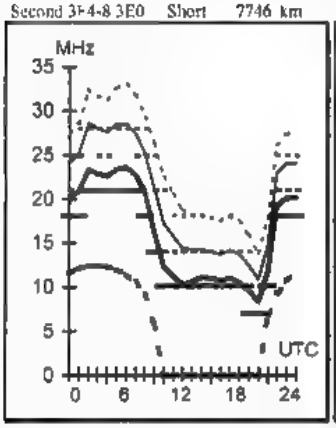
Adelaide-Moscow 318
First F 0-5 Short 13807 km



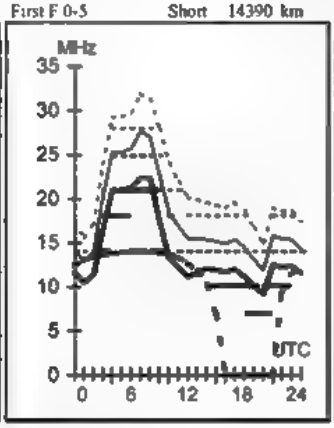
Brisbane-Berlin 321
First F 0-5 Short 15677 km



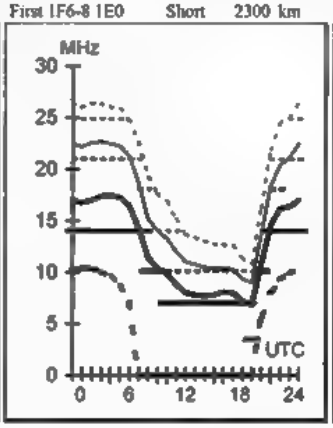
Adelaide-Osaka 357
Second 3F4-8 3E0 Short 7746 km



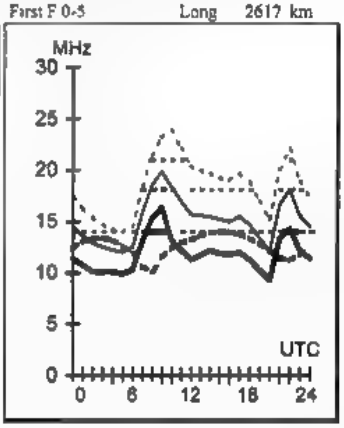
Brisbane-Cairo 288
First F 0-5 Short 14390 km



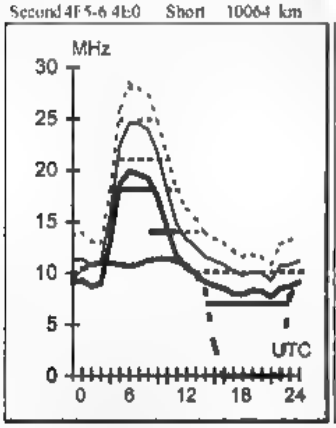
Canberra-Auckland 102
First 1F6-8 1E0 Short 2300 km



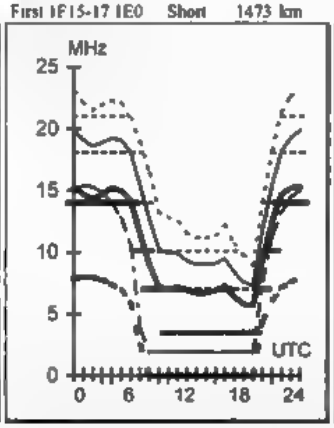
Darwin-London 145
First F 0-5 Long 2617 km



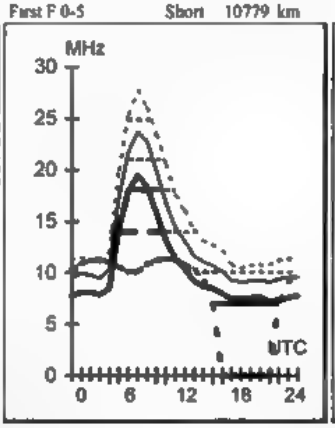
Adelaide-Pretoria 238
Second 4F5-6 4E0 Short 10064 km



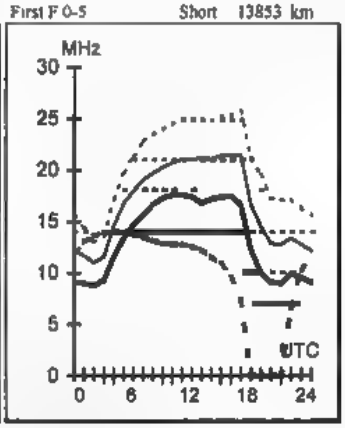
Brisbane-Noumea 70
First 1F15-17 1E0 Short 1473 km



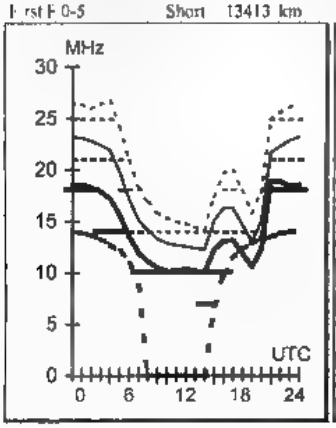
Canberra-Capetown 219
First F 0-5 Short 10779 km



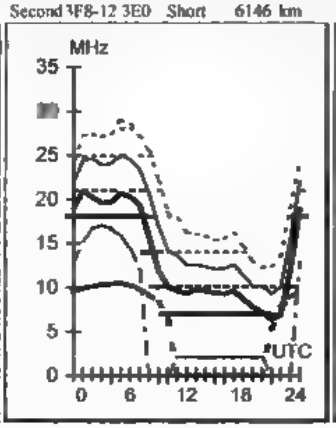
Darwin-London 326
First F 0-5 Short 13853 km



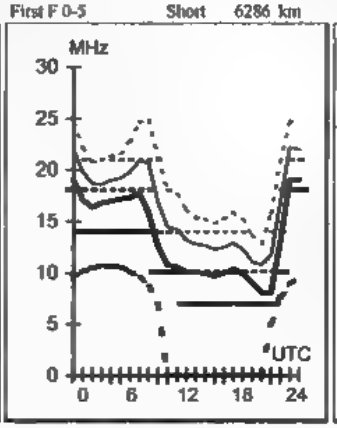
Adelaide-Seattle 51
First F 0-5 Short 13413 km



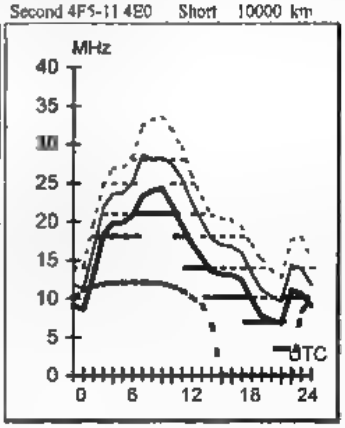
Brisbane-Singapore 295
Second 3F8-12 3E0 Short 6146 km



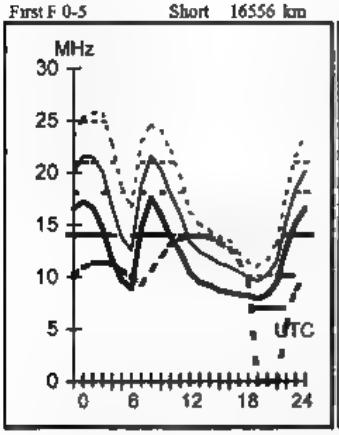
Canberra-Manila 327
First F 0-5 Short 6286 km



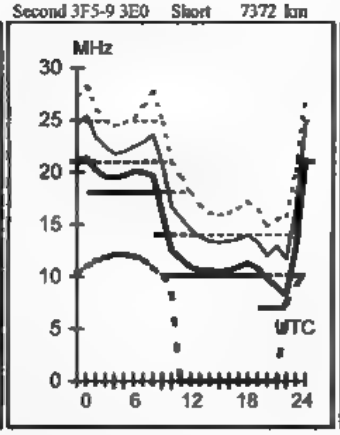
Darwin-Riyadh 295
Second 4F5-11 4E0 Short 10000 km



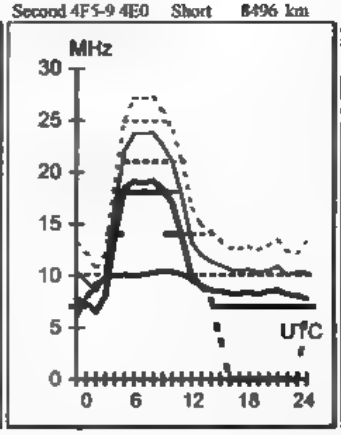
Hobart-Dakar 209
First F 0-5 Short 16556 km



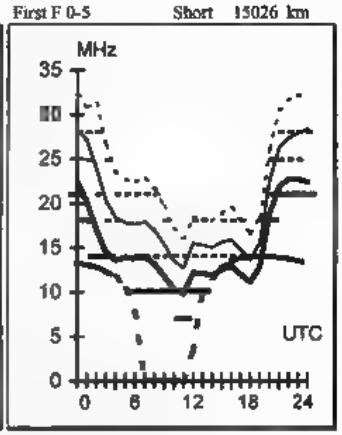
Melbourne-Bangkok 312
Second 3F5-9 3E0 Short 7372 km



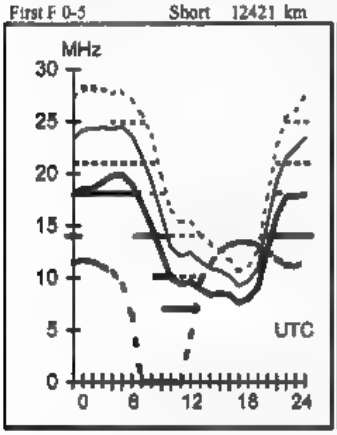
Perth-Harare 257
Second 4F5-9 4E0 Short 8496 km



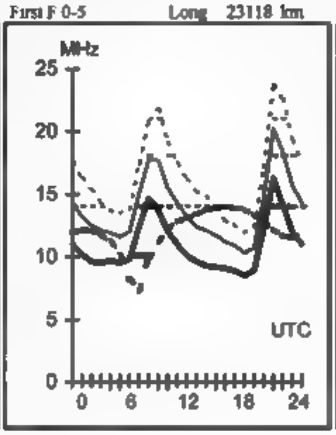
Sydney-Miami
First F 0-5 Short 15026 km



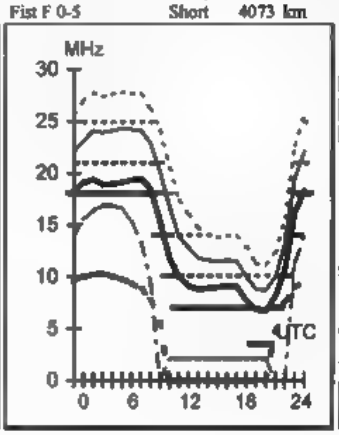
Hobart-Lima 72
First F 0-5 Short 12421 km



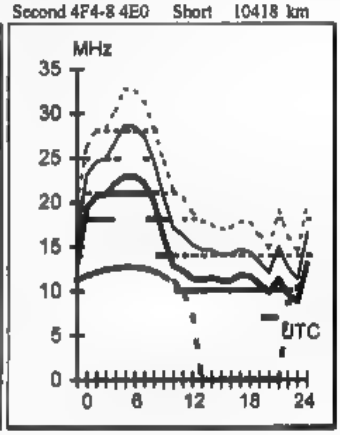
Melbourne-London 131
First F 0-5 Long 23118 km



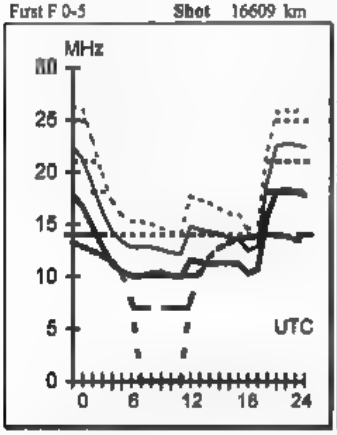
Perth-Port Moresby 59
Fist F 0-5 Short 4073 km



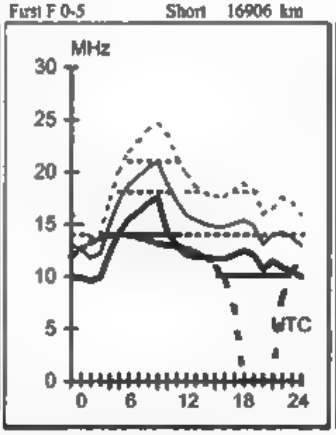
Sydney-New Delhi 302
Second 4F4-8 4E0 Short 10418 km



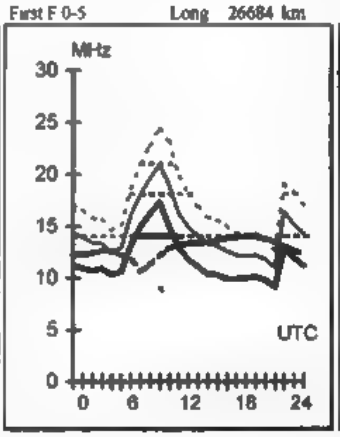
Hobart-New York 80
First F 0-5 Shot 16609 km



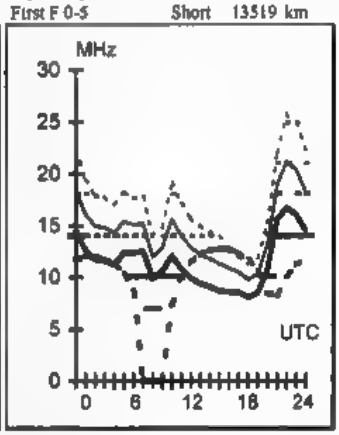
Melbourne-London 311
First F 0-5 Short 16906 km



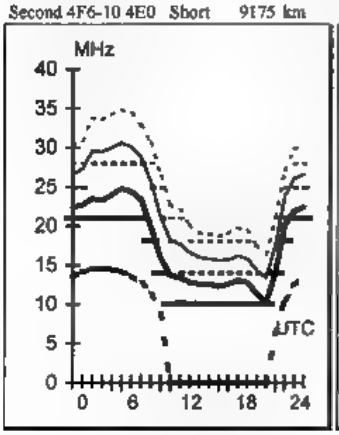
Perth-Rome 123
First F 0-5 Long 26684 km



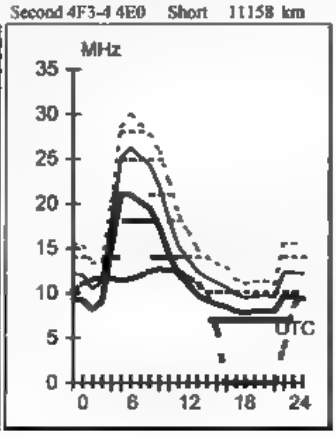
Sydney-Rio de Janeiro 164
First F 0-5 Short 13519 km



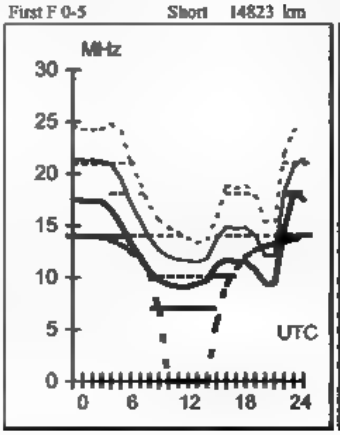
Hobart-Seoul
Second 4F6-10 4E0 Short 9175 km



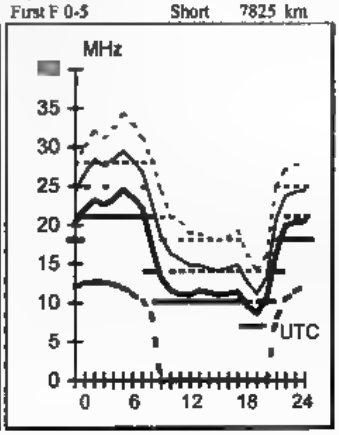
Melbourne-Lusaka 241
Second 4F3-4 4E0 Short 11158 km



Perth-Vancouver
First F 0-5 Short 14823 km



Sydney-Tokyo 350
First F 0-5 Short 7825 km



Hamads *classifieds* FREE

FOR SALE NSW

Kenwood TS-50S s/no 41122062, VGC with instruction manual plus full ($54) service manual $800. Tx valves 3E29/8298 with ceramic sockets (6) $25 each. Keith VK2AXN QTHR Phone 02 9489 0304 kandpa@bigpond.com

Tower, crank up to 17m, rotator and controller 115V or 26V and HyGain TH-3JR JR Beam $500 the lot. Aub Topp VK2AXT QTHR. Phone 02 9635 4384 any evening

DX location - Ulladulla NSW, with quality large 3BR two-storey home attached, separate 2BR guest accommodation. Headland location with ocean, coastal and mountain views. Walking distance to CBD and beach. Proven HF DX location, solid VHF and UHF paths Bega to Wollongong. Existing antennas, active local radio club. $615k, offers considered. VK2EL, Phone 02 4455 5825, sbourke@shoal.net.au

CRO dual 35 MHz $250, *Audio osc* sin/sq 0Ð100 kHz metered +6/-100 300/300 $75, *Yaesu ADMS-1E* HHs $40, *Ant TE33 KR-400* rotator 8m pole 9m FS tower $400, TNC MFJ1270 + disc $30, voltage/time/temp cer unit $15, data switch boxes (3) inc 5 leads $10, *Hills TV converter* UHF/VHF $10 *Zephyr 2IE-2k* mic new in box $5, TWT housing $FREE, collect beam, all + postage. Geoff VK2BGP QTHR Phone 02 4982 9748.

4-125A with socket and *QQV06-40A* with 3 sockets. Good condition. Ron VK2WB QTHR, Phone 02 4232 1794.

Kachina 505 DSP HF transceiver with software, manual and mike, price $1500. *Wilson System SY-1* widely spaced 4 element three band 2kW beam, price $350. *Dentron 2KW* antenna turner price $350. Tom, VK2OE@arrl.net, Phone 0413 796 851, 8-9 PM

WANTED NSW

Circuit diagram or hand book for *AWA 215 VHF transceiver*. A good photocopy will do. I am happy to pay copying expenses, or cost of a manual. John VK2DVW QTHR vk2dvw@hotmail.com or Phone 0409 821 357.

FOR SALE VIC

IC-728 s/n 02346, *AT-160, PS-55* (20 amps). All matching Icom with manuals and original packing. The lot $800. *Tower 38 feet*, one piece triangle, tube construction. Buyer to remove, easy to lower and handle $200. John VK3HCT QTHR Phone 03 9580 8369

Amateur Radio magazine 1980 to 1990 plus some extra overseas magazines. $20. VK3YRP Phone 03 9888 1201

Military Receiver R-390A made by Motorola S/N 1937. Clean, inside and out with refinished front panel and knobs, supplied with top and bottom covers. Fully operational and aligned. Has Collins PTO. Price $790. *Collins R105 A /ARR-15* receiver- (replaced the BC -348)- complete - no mods and comes with MT-461 mount and plug. EC condx.. S/N 398 0. Price $360. *BC-348Q* receiver with original dyno and shock mount FT-154. Mount has the ORIGINAL PL-P103 plug assembly. Shock mount is fairly rare, plug is even rarer. Radio no holes, no mods and panel /knobs been refinished in wrinkle per original. Price $650. Pete VK3IZ QTHR email. jupete@bigpond.net.au Email contact preferred during April absence o'seas until May 1. Freight/Packing extra. Photos on request.

WANTED VIC

Pole and first hinged stage of Nally Tower. Ken Morgan VK3CEK Phone 03 9592 9957.

Tamaya Digital Navigation Computer. Some time ago, I sent this computer to an amateur in Melbourne. I have now found the instruction manual for it, but I have lost your address and name. If you would please contact me at vk3dbb@bigpond.com or QTHR, I will send it on ASAP. Don VK3DBB

Good copy of Drew Diamond's *Radio Projects for the Amateur*, Volume 1, to complete my set. Call Don VK3DBB on 03 5941 1351 AH, or QTHR, or at vk3dbb@bigpond.com

FOR SALE QLD

Yaesu FT- 1000 with BPF-1 filter module,MD-1 desk mike,SP-5 speaker,OP manual. Ex cond. Any reasonable offer, VK4WD-SK Contact Colin VK4ACH- Phone 07 3356 9816 or Email tarah@powerup.com.au.

WANTED SA

1296 transceiver, Yaesu, Kenwood or other make(s) with 10 watt output, mobile. Being used for club project. Merv Phone 08 8346 7042 VK5MX QTHR.

MISCELLANEOUS

We want to hear from all who knew the 277 Radar. This type of radar was used in many services in WWII. We are establishing a historical display of one as part of the Bureau of Meteorology in Melbourne. Harvey Edwards VK3XKI, h.edwards@bom.gov.au, Phone 03 [redacted]

• **The WIA QSL Collection requires QSLs.** All types welcome, especially rare DX pictorial cards, special issue. Please contact the Hon Curator, Ken Matchett VK3TL, 4 Sunrise Hill Road, Montrose Vic 3765, tel. (03) 9728 5350

TRADE ADS

PSK-31, SSTV, RTTY SOUNDBOARD Interfaces. Fully isolated, ready to plug in. http://www.G3LIV.CO.UK, johnny@melvin.com, G3LIV QTHR.

RADIO SPECIALISTS sales and servicing. Buying radios. Shop: 243 Seacombe Road, South Brighton (Adelaide) 08 8298 3906

email:rfwizard@optusnet.com.au for prices.

NOTE I do NOT import radios from the USA. Can you afford to write a radio off? VK5VK

About hamads....

- Hamads may be submitted by **email** or on the **form on the reverse of your current Amateur Radio address flysheet**. Please print carefully and clearly, use upper AND lower case.
- Separate forms for For Sale and Wanted items. Please include name, address STD telephone number and WIA membership number if you do not use the flysheet.
- Deceased estates Hamads will be published in full, even if the ad is not fully radio equipment.
- WIA policy recommends that the serial number of all equipment for sale should be included.
- QTHR means the address is correct in the current WIA Call Book
- Ordinary Hamads from those who are deemed to be in general electronics retail and wholesale distributive trades should be certified as referring only to private articles not being re-sold for merchandising purposes.
- Commercial advertising (Trade Hamads) are pre-payable at $25.00 for four lines (twenty words), plus $2.25 per line (or part thereof). Forty word maximum, minimum charge of $25.00. Cheques are to be made out to WIA Hamads.
- Copy typed or printed clearly please, and received by the deadlines shown on page 1 of each issue of Amateur Radio.

Email: *newunltd@bigpond.net.au* **Fax:** *03 9756 7031*

Postal: *Newsletters Unlimited, PO Box 431, Monbulk Vic 3793*

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It is impossible for us to ensure that the advertisements submitted for publication comply with the Trade Practices Act 1974. Therefore, advertisers and advertising agents will appreciate the absolute need for themselves to ensure that the provisions of the Act are strictly complied with.

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All advertisers are advised that advertisements containing only a PO Box number as the address cannot be accepted without the addition of the business address of the box-holder or seller of the goods.

ADVERTISERS INDEX

Directory

The Amateur Service:

a radio communications service for the purpose of self training, intercommunication and technical investigation carried out by amateurs, that is, by duly authorised persons interested in radio technique with a personal aim and without any pecuniary interest. 1.56 ITU Radio Regulations.

The Wireless Institute of Australia represents the interests of all amateurs throughout Australia.

WIA membership fees are: ★ **$ 75 for full members (F grade),** ★ **$ 70 for pensioners and students (G and S grade), and** ★ **$ 50 for membership without 'Amateur Radio' (X grade).** ***Payment direct to National office.***

National Office	Contact	News Bulletin Schedule
10/229 Balaclava Road, Caulfield North VIC 3161, Australia	Phone 03 9528 5962, Fax 03 9523 8191, 10am to 4pm daily, nationaloffice@wia.org.au http://www.wia.org.au	Subject to change see www.wia.org.au follow national news prompts. Contact nationalnews@wia.org.au National VK1WIA news is distributed to all states.

Advisory Committees	Contact	News Bulletin Schedule
VK1 Australian Capital Territory VK1WX Alan Hawes VK1ZPL Phil Longworth VK1ET John Woolner VK1GH Gil Hughes	secretary@vk1.wia.ampr.org	Sundays at 11.00 am VK1WIA 7.128, 146.950,438.050 Canberra Region Amateur Radio Club Email newsletter will be sent on request to president@vk1.ampr.org
VK2 New South Wales VK2QV Chris Flak VK2XCD Chris Devery VK2BFN Adrian Clout	Phone 02 9689 2417	VK2WI - Sunday 1000 and 1930 hours local.1.845; 3.595; 7.146; 10.125; 14.170; 28.320, 52.525; 145.600; 147.000; 438.525; 1273.500 megahertz. Plus regional relays. VK1WIA news included in the morning
VK3 Victoria VK3JJB John Brown VK3PC Jim Linton VK3APO Peter Mill	Phone 03 9885 9261 advisory@wiavic.org.au	VK1WIA Sunday 11.0am via HF and major VHF / UHF rptrs
VK4 Queensland VK4ERM Ewan McLeod VK4ZZ Gavin Reibelt VK4KF Ken Fuller	Phone 07 3221 9377 qac@wia.org.au ewan.mcleod@bigpond.com	VK1WIA, Sunday 9.0am via HF and major VHF/UHF rptrs
VK5 South Australia and Northern Territory VK5NB Jim McLachlan VK5APR Peter Reichelt VK5ATQ Trevor Quick	Phone 08 8294 2992 jimac@picknowl.com.au peter.reichelt@bigpond.com vk5atq@chariot.net.au	VK5WI: 1843 kHz AM, 3.550 MHz LSB, 7.095 AM, 14.175 USB, 28.470 USB, 53.100 FM, 147.000 FM Adelaide, 146.800 FM Mildura, 146.900 FM South East, 146.925 FM Central North, 438.475 FM Adelaide North, ATV Ch 35 579.250 Adelaide. (NT) 3.555 LSB, 7.065 LSB, 10.125 USB, 146.700 FM, 0900 hrs Sunday. The repeat of the broadcast occurs Monday Nights at 1930hrs on 3585kHz and 146.675 MHz FM. The broadcast is available in 'Realaudio' format from the website at www.sent.wia.org.au Broadcast Page area.
VK6 Western Australia VK6NE Neil Penfold VK6XV Roy Watkins VK6OO Bruce Hedland-Thomas	Phone 08 9351 8873 http://www.vk6.net/ advisory@vk6.net vk6ne@upnaway.com vk6xv@bigpond.net.au	VK1WIA Sunday 9.0am via WIA network
VK7 Tasmania VK7ZAX Phil Corby VK7DG Dale Barnes VK7KK Reg Emmett	Phone 03 6234 3553 phil.corby@tassie.net.au vk7dg@wia.org.au regemm@ozemail.com.au	VK1WIA Sunday 9am on VK7WI network: 3.570MHz LSB, 146.700 MHz FM (VK7RHT South), 53.825MHZ FM (VK7RAD South), 147.000MHz FM (VK7RAA North), 146.750 FM & 53.825MHz (VK7RNW North West), 146.625 MHz FM (VK7RMD North West), UHF CB Channel 15 (Hobart) and 27MHz CB - 27.225MHz LSB (Hobart). Followed at 9:30am with VK7 Regional News Broadcast also on 7.090MHz LSB & 14.130MHz USB

Notes

1. Only three members of the state advisory committees are listed.
2. All listings are preliminary. They will be updated each month as required.
3. Membership application forms are available from the WIA web site www.wia.org.au or the national office address above.

sseti EXPRESS

Graham Shirville G3VZV

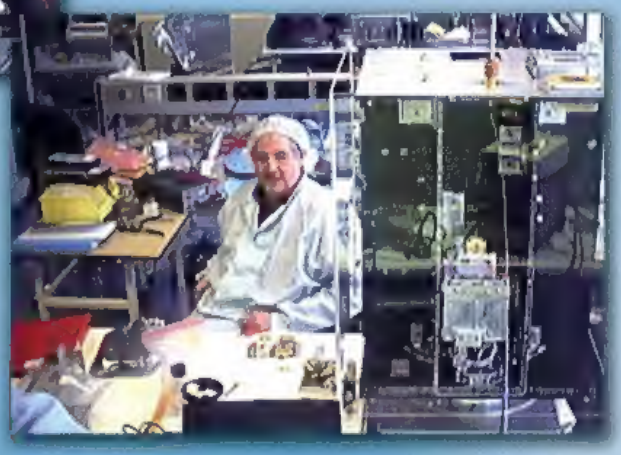
SSETI Express is the first of a series of satellites being developed by the Education Office of ESA – The European Space Agency as part of the "Student Space Exploration & Technology Initiative"

It is being built by university students from a number of teams from all across Europe and being assembled at the ESA ESTEC facility in the Netherlands.

The satellite is set for launch on a Cosmos rocket later this year with a number of other satellites into a sun synchronous 98° 680km orbit from Plesetsk in Russia.

Neil Melville - SSETI Express Project Manager captured on the Webcam on 8th March 2005 - admiring the satellite under construction in the clean room at ESTEC!

see article on page 39

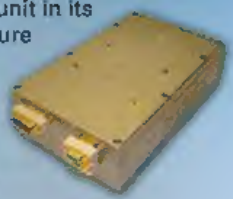


Sam Jewell G4DDK captured on the webcam "resting" in the clean room on 3rd March 2005

The Ground Station

The joy of a successful baud rate change

The S band unit in its enclosure



ICOM'S GREAT CHAMPIONS

ICOM FLAGSHIP TRANSCEIVER

IC-7800 HF*6m

• Four 32-bit floating point DSP units • +40dBm ultra high intercept point • Automatic tracking pre-selector • Two completely independent receiver circuits • 200W output power at full duty • Ultra high frequency stability • 7-inch wide color TFT LCD • Multi function spectrum scope • RTTY / PSK31 operation without PC connection • Professional 6m receiver • Digital Voice Recorder • CF memory card

NEW

IC-756PRO III HF*6m

Sharp & soft IF filter shape • New receiver gives +30dBm third-order intercept point • One-touch record/play Digital voice memory • Extended 1/4 Tuning step & BPF functions for SSB-D mode • 32-bit floating-point DSP and 24-bit AD/DA converter • SSB/CW sychronous tuning • 5-inch color TFT LCD • Built-in antenna tuner • Customisable filter shap • No optional filters to buy

IC-706MKIIG

The amazing evolution of the legendary 706.

Now includes 70cm @ 20W and 50W on 2m
Standard feature dsp • Built in sub tone encoder & decoder Tone scan • Mosfet PA • You get base station performance and features in a mobile rig sized package

NEW

IC-V82 7w VHF Handheld

207 Alphanumeric memories • DTCS & CTCSS Tone Squelch • DTMF encoder • Digital voice and data communication (Req. UT114 option) • GPS receiver can be connected • BNC type antenna connector

IC-208H FM Dual Band Transceiver

Dual Band Features at a Single Band Price • 55W / 2m, 50W / 70cm • Built-in CTCSS and DTCS Tone Squelch Detachable Front Panel (Req. OPC-600/601 Option) • 9600 bps Packet Operation • 512 Memory Channel • Standard Mic. Supplied:HM133.

IC-T90A A new 5W Triband handheld

VHF/UHF FM 2M, 6M, & 70CM
Wideband receive 495 KHz - 1 GHz
555 Alphanumeric memories • 13 Scan modes DTCS & CTCSS encode & decode DTMF encoder (10 memories) Wide/narrow transmit capability.

ICOM

PH416_AMI2

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